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INDIANA UNIVERSITY STUDIES



Study No. 40.

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*Submitted in partial fulfilment of the requirements for the degree
Doctor of Philosophy at Indiana University.*

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The "American Bottoms" Region of Eastern Greene County, Indiana—A Type Unit in Southern Indiana Physiography

CLYDE A. MALOTT, Ph.D., Assistant Professor of Geology, Indiana University

INTRODUCTION

THERE are few regions with more diversified physiographic conditions and resulting wealth of topographic detail than southern Indiana. The fairly uniform monoclinal dip of the rock strata to the west-southwest brings to the surface a highly variable succession of strata, each lithologic type having its characteristic topographic forms. Since several erosion cycles have been initiated, only the oldest of which ever neared completion, the physiographic and topographic features have been multiplied and rendered complex. Another highly important influence has been that of partial glaciation. The Illinois glacial lobes came in from the north on the two sides of the state, reaching as far south as the Ohio River, but coming together or overlapping in the middle of the state only as far south as northern Monroe County, thus leaving a triangular area, with apex to the north, some 5,000 square miles in extent. The effects of the glacial ice over the area covered by it largely determine the topographic features. In the region adjacent to the glacial margin are found some rather peculiar and striking drainage modifications and resulting topographic features. Since the drainage of southern Indiana, especially its middle and western part, is almost exclusively toward the west and south, these drainage modifications are to be found chiefly on the western side of the unglaciated area.

While there is, therefore, a great variety of topographic forms resulting from the physiographic conditions mentioned above, the complexity is not so extreme as may appear to the

casual observer. The types of rock exposed to the physiographic processes give rather distinct regional physiographic strips in succession from east to west. In a region like southern Indiana, which has been subjected to minor uplifts from time to time with short periods of stability between, the kind of rock is the controlling conditioning factor. It is easy to see in crossing the unglaciated area of southern Indiana from east to west that both the major and minor features are largely due to the kind of rock present. It follows, therefore, that any discussion of the physiography must take fully into consideration the areal geology, in so far as the latter is related to the lithologic type. While the type of rock of the various physiographic belts has been a controlling condition, there are also a number of forms, such as high, level-topped dividing ridges, local peneplains, and similarly developed stream trenches, common to all parts of the unglaciated area. With proper care these may be traced thru the various physiographic belts, and correlated. Since the major lines of drainage either rise in the glaciated area to the east, or in the unglaciated area, and pass thru it into the glaciated area to the west or into a stream itself affected by glaciation, there are as a consequence certain other sets of conditions and results tending to give continuity to the physiographic types.

Thus, it will be seen that the physiography of southern Indiana may have had its features determined by any one or any combination of four sets of conditions: first, the type of rock exposed; second, the several uplifts with intervening short periods of stability; third, glaciation on two sides of a triangular unglaciated area; and fourth, the fact that the main elements of the drainage flow toward the west or south from the glaciated region on the east, across the unglaciated area and into the glaciated area to the west, or into a stream that has been affected by glaciation. The physiography of southern Indiana may be expressed in terms of one or more of these four sets of conditioning factors.

The locality known as "American Bottoms" in eastern Greene County, Indiana, illustrates all four of the above conditioning factors, and may, therefore, be considered as a unit or type of southern Indiana physiography. With these introductory remarks we are now ready to pass to a consideration of the details of the region in question.

LOCATION, EXTENT, AND NAME OF THE "AMERICAN BOTTOMS"

The area included in the present discussion is represented on two maps, one of which shows the topography and drainage and the other the geology. The geologic map carries a small insert of Greene County, showing the location of the mapped area within the county. The "American Bottoms" proper are situated in T. 7 N., 3-4 W., and consist of a filled valley about five miles in length and as much as a mile in width. The mapped area includes parts of these townships and a small part of T. 6 N., R. 4 W. The entire mapped area comprises about 40 square miles. It will be seen by reference to the geologic map that most of the area lies within the driftless portion of the state, but that the eastern margin of the Illinois Glacial Lobe affected the western edge. A greater area is mapped than is directly concerned with the phenomena of the "American Bottoms". Beech Creek valley is in no way connected with the "American Bottoms", but its inclusion on the map gives clearness to the position and succession of the rock formations, and brings out the contrasted elevations of these two valleys. It will be seen that the presence and position of certain kinds of rock are of the very first importance in preserving the broad, flat surface of the "American Bottoms", which have resulted from the filling of a pre-glacial valley in front of the Illinois Glacial Lobe.

Just why certain elevated, broad, alluvial terraces adjacent to streams, or certain broad, filled valleys should so frequently be called "American Bottoms" has never been made clear to the writer. The first description and attempted explanation of the "American Bottoms" of eastern Greene County is by G. H. Ashley in the Twenty-Third Annual Report of the Indiana Department of Geology and Natural Resources for 1898, from notes made by C. E. Siebenthal. Ashley does not propose the name "American Bottoms" for the broad, flat, filled valley, but says that this name has been given to it. The only other mention of the region in geologic literatures is in *Monograph XXXVIII*, of the United States Geological Survey, where Leverett, using Siebenthal's notes, calls attention to the filled valley as having been the site of a glacial lake "now known as the 'American Bottom'". It is not clear whether Siebenthal gave the area the name which it now bears, or whether the name had been previously in use.

DRAINAGE AND TOPOGRAPHY

Only an outline of the drainage and topography need be included under this heading, since the topographic map has been prepared expressly to exhibit them. In general, the main streams flow to the west or southwest. Beech Creek flows along the northern edge of the area, and enters Richland Creek at the northwest corner. Clifty Creek, heading near the village of Cincinnati, flows west, and after traversing a number of remarkable meanders and stretches of subterranean drainage, turns southwest into Plummers Creek. The latter, with a course slightly north of west, enters the area toward the southwest, and leaves near the southwestern corner. The headwaters of Ore Creek occupy the middle western edge of the area. Bridge Creek is the principal stream in the "American Bottoms". This stream is altogether peculiar, as it empties abruptly into a cavern in the sandstone bluff on the south side of the valley. Several smaller streams in the western and southwestern portions of the "American Bottoms" are smaller replicas of Bridge Creek. The waters from Bridge Creek and these smaller streams of the "American Bottoms", after an underground journey, debouch from two or three openings in the sandstone bluff in the northeast quarter of section 34, T. 7 N., R. 4 W., where they form springs in the valley of a stream which flows into Clifty Creek.

The relief of the region varies from 525 feet above sea level in the broad valley of Plummers Creek to over 800 feet above sea level on the crests of a number of gentle prominences along the ridges between the main drainage lines. In the region of Cincinnati, where the main streams of the region head, an elevation of 900 feet is reached. Thus, the maximum relief of the area is about 375 feet. A representative difference in elevation between the ridge and valley may be seen in the vicinity of Ridgeport, where the crest of the ridge is approximately 800 feet, and the valley of Beech Creek is about 550 feet above sea level. This gives an immediate relief of approximately 250 feet. The ridge between Bridge and Clifty creeks is also approximately 800 feet in elevation, and Clifty Creek valley is 575 feet above sea level, giving a relief difference of about 225 feet. Bridge Creek valley, or the "American Bottoms", lies approximately 650

feet above sea level; so that its elevation is about 100 feet greater than the adjacent valleys. A brief inspection of the topographic map reveals at once the presence of two westwardly extending, gently undulating ridges, formed by the bifurcation of a single broad ridge near Cincinnati. From these two ridges numerous spurs extend out to the north and south. The deep valleys of Beech and Clifty creeks lie on the north and south respectively, while the broad elevated valley of the "American Bottoms", with its peculiar drainage, lies between the two ridges. To the southwest, north of Kolean, is a broad ridge between Plummers and Clifty creeks. This ridge is terminated rather abruptly by the narrow valley of Clifty Creek, which cuts it in two, leaving a subdued remnant on the west side. It is in this region that the most prominent cliffs appear. Sheer descents of 50 to 75 feet are found, and these are responsible for the name Clifty Creek.

Further discussion of the drainage and topography will be given in the section on the detailed description and interpretation of the physiographic features of the region.

THE GEOLOGY OF THE "AMERICAN BOTTOMS" REGION AND THE TOPOGRAPHIC AND PHYSIOGRAPHIC INFLUENCES OF THE LITHOLOGIC UNITS

Under this head it is the intention to emphasize the stratigraphy of the region with special reference to the lithologic succession. Formation names will be used mainly for the identification of the horizons under discussion, and for the purpose of calling attention to such strata as are clearly responsible for topographic and physiographic forms. Since the position of certain strata at critical levels is important, the general structural conditions are also discussed. In this respect it may be said that the general dip to the west-southwest at the rate of approximately 30 feet per mile carries the higher strata of the eastern part of the area to lower and lower positions to the west and south. As in the discussion of drainage and topography, attention was directed to the topographic map, so here attention is called to the geologic map, and especially to the areal distribution of the strata and to the stratigraphic column at the right of the geologic map. This column shows by the usual conventional

signs the lithologic succession of the solidified strata, as well as the corresponding symbols used to indicate the areal distribution of formations on the map. It was not found convenient or practical, especially in the case of the thinner members, to show each lithologic unit on the map. It is seen that the bedrock strata which occur in the region are of upper Mississippian and lower Pennsylvanian age, and that these two periods are separated by a disconformity.

The Mississippian Strata. The Mississippian strata found in the region are confined entirely to the Chester Series, and consist of limestones, shales, and sandstones. Recent work, yet unpublished, on the Chester Series of Indiana has led to a definite naming of the series of formations. This work was done by the writer and J. D. Thompson, of the Empire Gas and Fuel Company, during the summer of 1918. The various formations as they occur in the region here under discussion will be given the names as determined by this latest work on the Chester of Indiana. This work consists mainly in the correlation of the formations with those of Kentucky, following the nomenclature of Butts, of the United States Geological Survey, whose work was published by the Kentucky Survey in 1917. Several new formational names are introduced for the Indiana region, some of which have no representatives in Kentucky. No change has been made in the divisions and nomenclature below the top of that great thickness of limestone known in Indiana as the Mitchell limestone, the upper part of which belongs to the Chester and the lower part to the St. Louis.

The Mitchell Limestone. The Mitchell limestone is really a group of formations, but makes one great lithologic unit very difficult to divide in a mapable way. The upper part in Indiana is equivalent to the Gasper Oölite and the Fredonia Oölite of Kentucky and is Chester in age, while the thicker lower part is the St. Louis limestone. Only the uppermost part outcrops in the "American Bottoms" region.

The upper part of the Mitchell limestone is found near the head of Beech Creek valley. It consists of thin layers of compact sub-oölitic limestone, and rises approximately 25 feet above the floor of Beech Creek valley, in section 9. To the west the dip carries it beneath the alluvium of the stream. To the east along Beech Creek, in section 10, the Mitchell

limestone does not appear above the valley alluvium, on account of the presence of a disconformity and the consequent deposition of the succeeding sandstone in its place.

The Mitchell limestone to the east of the region under discussion forms a surface rock of high importance from a physiographic standpoint, being responsible for a structural peneplain characterized by magnificent subterranean drainage systems and an attendant highly developed karst topography. Since its outcrop is limited to a very small part of the area under discussion, and its position is for the most part at or below drainage level, it is of little physiographic influence here.

The Sample Sandstone and its Horizon. Overlying the Mitchell limestone are gray and blue shales containing lenses of sandstone, sometimes quite massive and attaining a thickness of from 10 to 30 feet. This shale and sandstone horizon fills the interval between the Mitchell and another limestone from 5 to 20 feet thick, and occupies the position of the Sample sandstone. The Sample sandstone receive its name from its excellent exposures near Sample, Breckinridge County, Ky., where it occurs as a division in the Gasper Oölite.¹ The limited thickness of 20 feet, and the small areal outcrop of the shales and the associated lenses of sandstone render it of little importance physiographically in the region under discussion.

The Beaver Bend Limestone. The limestones mentioned in the preceding paragraph as succeeding the Sample sandstone horizon is a bedded limestone, often having massive beds, and is highly oölitic. It is conspicuously jointed, and, on this account, gathers waters into concentrated streams from the porous sandstone usually found above it. These waters come out as springs at the base of the limestone on the underlying impervious shale. Field work has demonstrated that this limestone is found consistently practically from the Ohio River northward as far as the Chester Series extend, into Putnam County. Locally, however, it appears to be separated by only a slight interval from the top of the Mitchell limestone; and in a number of places it has been removed by the erosion which in certain places extended down

¹ Charles Butts, Mississippi Series in Western Kentucky. *Kentucky Geological Survey*, 1917.

into the Mitchell limestone. The name proposed for this lithologic unit is the Beaver Bend limestone from a conspicuous bend in Beaver Creek just east of Huron, Lawrence County, Ind., where the Baltimore and Ohio Railroad cuts thru a spur on the inside of the bend. Its entire thickness of 14 feet may be seen there near the bottom of the cut. It is the Upper Gasper of Kentucky, as seen in the region of Sample, where the Sample sandstone divides the Upper Oölite into an upper and lower member. The Beaver Bend limestone appears locally thruout the length of Beech Creek, except to the east, where the Elwren sandstone in an unusually thick mass comes down and occupies the position of the eroded portions of several members, including the upper part of the Mitchell limestone, as mentioned above.

The Brandy Run Sandstone Horizon. Above the Beaver Bend limestone occur some 10 to 20 feet of gray-blue shales and sandy shales, overlaid in turn by another thin limestone. This interval represents the stratigraphic position of a sandstone which farther south in Indiana becomes quite prominent, and reaches a thickness of 30 to 50 feet. The latter is excellently developed in the region of Marengo, on Brandy Run Creek, and the name Brandy Run sandstone is proposed for the formation. It thins out south of the Ohio River, and is absent beyond Breckinridge and Meade counties, Ky. The horizon has little physiographic interest in the region under discussion.

The Reelsville Limestone. The thin limestone mentioned above, which overlies the horizon of the Brandy Run sandstone, is typically only 2 feet thick. It is a compact to semi-crystalline limestone, frequently quite oölitic in texture, and almost always sub-oölitic. It contains considerable pyrite which causes it to weather to a characteristic red color. The remarkable feature of this limestone is its persistence over a wide area. It is found at Reelsville, Putnam County, Ind., from which locality it is proposed that it be named. From there southward it forms a single consistent ledge, until middle Crawford County is reached, where several other thin ledges come in on top of the main one. It can be traced over a wide area in Meade and Breckenridge counties, Ky., and is there rarely over 10 feet in thickness. Its fauna is closely allied to that of the Gasper Oölite. It is of little or no im-

portance physiographically in Indiana. Its outcrop is confined to Beech Creek valley in the region here considered, and it is only infrequently seen in position.

The Elwren Sandstone and Shale. The lithologic unit succeeding the Reelsville limestone consists of one or more members of sandstone and frequently considerable thicknesses of shale, the whole having a total thickness of 40 to 50 feet. The name proposed for this formation is the Elwren sandstone, from the vicinity of Elwren in western Monroe County, Ind., where excellent exposures are to be seen in the cuts of the Illinois Central Railway. It fills the interval between the thin Reelsville limestone and the next limestone above. The Elwren sandstone and shale unit is represented on the geologic map by a single convention. In the region of the "American Bottoms" it consists of a sandstone from a few feet up to 30 feet in thickness, and a gray-blue shale, with a maroon streak extending up to the overlying Beech Creek limestone, or to another sandstone member near the top. The latter in places attains a thickness as great as the lower sandstone member. The upper sandstone is thick where the lower sandstone is thin. This latter condition is shown in the typical stratigraphic column taken from Ray's Cave section along Beech Creek near Ridgeport. The sandstone is usually bedded, but is occasionally massive. The Elwren sandstone and shale unit outcrops on both sides of Beech Creek valley thruout its course, and along the upper part of Clifty Creek valley. North and east of the extreme northeast corner of the mapped area the Elwren sandstone has unusual thickness, occupying the position of several of the lower units which had been eroded away previous to the deposition of the Elwren sandstone. Topographically the Elwren sandstone gives rise to local benches where it takes on the massive phase, as may be seen in the northwest quarter of section 7, on the north side of Beech Creek. Since the sandstones are medium to fine grained and usually contain considerable clay, they form slopes rather than bluffs and cliffs.

The Beech Creek Limestone. The next stratigraphic unit in the Chester Series is the Beech Creek limestone. This name is proposed for the limestone unit which has heretofore been called the "Middle" or "Second" limestone of the Ches-

ter Series of Indiana, according to Kindle, Hopkins, Ashley, and others. It receives its name from its excellent exposures along Beech Creek in the region under consideration. This



FIG. 1. Mouth of Ray's Cave, near Ridgeport. Shows entire thickness of Beech Creek limestone (below) and Cypress sandstone (above). Photograph by P. B. Stockdale.

limestone has a narrow areal outcrop, but it is given on the geological map a separate convention. It consists of two or more massive to thin bedded ledges with a total thickness of

8 to 24 feet, and a typical thickness of 12 feet. In the region considered in this discussion it attains its maximum thickness of 24 feet, as seen in the Ray's Cave section (Fig. 1). Thruout the region of the "American Bottoms" it must have a thickness of 20 feet or more, and in places may possibly exceed its thickness in the Ray's Cave section. Everywhere thruout the state from Owen County south to the Ohio River, where the Beech Creek limestone is exposed in weathered outcrops, it presents a ragged face made up of cubical chunks of limestone. It is a gray, compact to sub-öolitic, and often semi-crystalline limestone, frequently locally quite completely öolitic, and contains large numbers of brachiopods, especially of the genus *Productus*. Of the succession of Chester limestones, none contains such a number of large, well-preserved crinoid stems standing out prominently on the weathered faces as the Beech Creek. This feature along with the hackly, cubical weathering gives it such distinguishing characteristics that it can be easily told from any of the other Chester limestones in the state. In the "American Bottoms" region, there is an added thickness at the top. This added thickness consists of coarse, crinoidal ledges with a considerable admixture of sand and clay. These upper ledges weather a distinct yellow. It would appear that the area may have been a local basin, or have led into one of considerable dimensions to the west. These upper yellow ledges contain a number of species of *Archimedes*.

The Beech Creek limestone is quite persistent thruout the outcrop of the Chester in Indiana. Only locally is it absent where the strata are sufficiently high for its occurrence. Across the Ohio River it thins out and farther south is absent. At Sample, Ky., in the shale some ten feet above the Reelsville limestone is a thin ledge of limestone about 4 inches thick that probably represents the Beech Creek. Likewise, in a railroad cut some two miles east of Garfield in Breckinridge County there is a ledge 6 inches thick which is its probable representative. A short distance away from this latter place the overlying massive Cypress sandstone comes down considerably below the horizon of the Beech Creek. It may be added that toward the eastern outcrop of the Chester in southern Indiana there is conclusive evidence that the upper Chester formations overlap the lower ones, and this

overlap is quite notable in the Cypress sandstone, so that this latter formation may be expected to lie on lower and lower strata to the east.

The Beech Creek limestone outcrops along Beech Creek and its tributaries high above the valley floor, and along Clifty Creek to its junction with Plummers Creek valley. In the latter case it comes down to the valley level, and in places is hidden by the valley alluvium. It outcrops only in the easternmost ravines of Bridge Creek, and is below the level of the flat "American Bottoms" valley. In the northeast corner of the area it does not seem to have been deposited at all. It is a rather curious fact that the area where the Beech Creek limestone has not been deposited should be coterminous with the area characterized by the development of the massive phases of the Elwren sandstone and the notable disconformity at its base. This raises a question the discussion of which cannot be undertaken in the present paper.

The Beech Creek limestone is of great importance from both the topographic and physiographic standpoints. Along its outcrop it frequently stands out as a wall-like bench, partly on account of the shale which characteristically underlies it, and partly because of its recession *en masse* on weathering. Its highly jointed condition allows it to collect waters from the overlying sandstone into concentrated streams, the outflow of which in steep-headed ravines and gorges makes it perhaps the most extensive and persistent spring-bearing horizon in the Mississippi valley. It possesses this character because of its relation to the massive overlying sandstone which has a high porosity. These springs often yield a considerable volume of water, and the characteristic steep-headed gorges with their high walls of solid rock are common thruout the region of the outcrop of this formation, especially where the limestone is rather high above the drainage level. The Ray's Cave gorge is typical (Fig. 1). Another example, well outside the region in question, is "The Gorge" southeast of French Lick, whose scenic beauty has been commercialized, so that any visitor who cares for an out-of-town dinner may partake of one of the excellent chicken dinners for which the place is noted. As may be inferred from the presence of these gorges with such large volumes of water coming from their steep-walled heads, the solution of the limestone along

the joints has frequently enlarged them to caves of considerable size and length, considering the limited thickness of the formation. Ray's Cave, near Ridgeport, is a cave of very uniform width and height, following the joints strictly, and turning frequently at sharp angles. This cave may be easily followed for a distance of about 1,000 feet, to a point where further progress is arrested by a mass of great sandstone blocks fallen from above. This distance, however, must represent only a small part of the total length of the cave, since a large volume of water comes from under the fallen debris.

Just how important this limestone is physiographically will be clear when it is realized that the peculiar drainage conditions in the "American Bottoms" are due to its presence at critical levels. Bridge Creek and its smaller associates do not empty their waters into the sandstone bluff for any other reason than that the Beech Creek limestone is immediately below it. This limestone is, in fact, only 10 feet below the point where the waters of Bridge Creek enter the sandstone, tho the limestone itself is nowhere visible about the margin of the "American Bottoms" flat. Had it not been for the presence of this 20 odd feet of limestone at this particular level, there could have been no subterranean drainage, such as occurs, nor could there have been preserved the unusually broad, filled valley, which, for the most part, is wholly intact. The physiographic effect of this limestone at a critical level is seen again in the southwest quarter of section 35, along Clifty Creek, where the limestone has been carried by the dip to slightly below the level of the stream, permitting the local development of subterranean drainage by the waters of Clifty Creek. Only the flood waters pass around the great double meander at this point. The water passing thru this subterranean passage, or rather passages, along the enlarged joints in the limestone is lost to view for a distance of about one-fourth of a mile, and nearly 150 feet beneath the crest of the ridge above. This underground passage-way of Clifty Creek is in its initial stage, but we can see that it must finally cause the complete abandonment of the surface channel, leaving the great double meander of a dry valley sunk deeply into the strata, the product of a stream which has entrenched itself since the invasion of the Illinois Glacial Lobe into the region (see Fig. 2).

The Cypress Sandstone. Cypress sandstone is the name applied to the massive, usually non-bedded, sandstone, overlying the Beech Creek limestone. This sandstone is the most

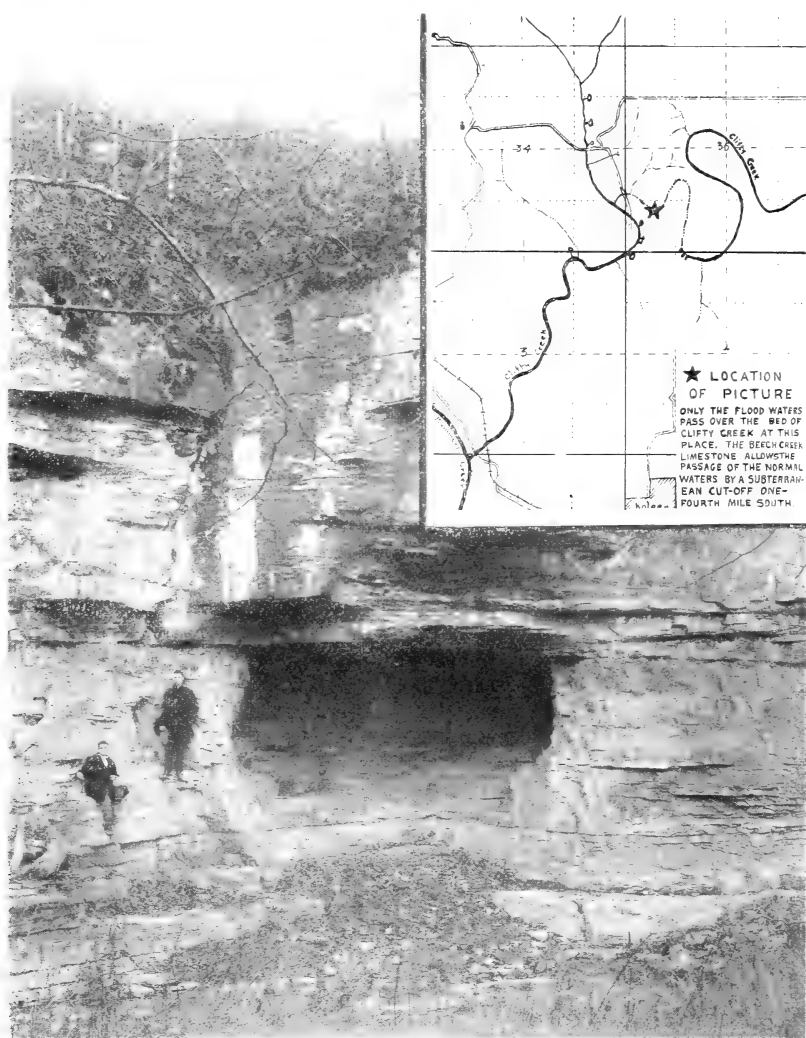


FIG. 2. Bluff on Clifty Creek, showing contact of the Beech Creek limestone and the Cypress sandstone. This part of the post-glacial stream is now being abandoned in favor of subterranean drainage. Photograph by P. B. Stockdale.

persistent sandstone of the Chester Series, and is only locally absent, shale being sometimes substituted for it where its

horizon appears. It is normally 30 feet thick along its whole outcrop in Indiana, but is occasionally thinner or thicker. The Cypress sandstone receives its name from its excellent exposures along Cypress Creek, southwestern Johnson and Union counties, Ill., where it attains a somewhat greater thickness than in Indiana.² It has been traced by Butts around the crescentric outcrop of the Chester Series thru Kentucky to the Ohio River.³ Field work in 1918 by J. D. Thompson and the writer has proved its wide extension in Indiana. It appears everywhere its horizon is due. Evidence is at hand to show that it is an overlapping formation, and that it is perhaps the most continuous and widespread of all the formations in the Chester Series within the limits of its horizon.

The Cypress sandstone is usually a medium-grained sandstone, tho often quite coarse; it is yellowish to whitish in color, except along its well-developed joints, where it assumes a reddish brown color due to the concentration of iron oxide. It is usually massive and non-bedded, but laminated, and except along the joint planes and exposed surfaces, quite friable. Since the rock is so well cemented along the joint planes, its outcrop often exhibits great broad faces and rectangular blocks along the wall-like outcrop (Fig. 2). In the "American Bottoms" region it is from 30 to 40 feet thick, and rests everywhere directly upon the Beech Creek limestone. It is usually cross-bedded near the contact (Figs. 1 and 2). Toward the top it frequently becomes thin bedded, and rapidly grades into the blue-gray to olive shale that underlies the Golconda limestone.

The Cypress sandstone is well developed high above Beech Creek valley along its middle and lower course. It is found everywhere along Clifty Creek, reaching the valley level along the lower course of the creek, and in conjunction with the Beech Creek limestone causing characteristic bluffs and cliffs (Figs. 2 and 3). It everywhere marks the rim of the "American Bottoms", usually causing an abrupt rise from the monotonous valley flat.

The Cypress sandstone, as indicated above, is everywhere an important topographic and physiographic factor, ranking

² H. Englemann, *Geological Survey of Illinois*. Vol. I, 1866.

³ Charles Butts, Mississippian Series in Western Kentucky. *Kentucky Geological Survey*. 1917.

next to the Beech Creek limestone in this respect in the "American Bottoms" region. It has a wall-like appearance along the streams, whether it be next to the valleys or high up the valley slopes. Since it is overlaid by shale it gives rise to rather sharp local benches, often of considerable breadth where erosion has removed the overlying material down to its resistant top. These benches have been mistakenly interpreted as local peneplains developed in the region where the sandstone is to be found. They are seen prominently above the abrupt slope produced by the sandstone where it rises above the "American Bottoms". To the west the benches become considerably lower on account of the dip of the strata. Such benches are conspicuously developed on the north side of the "American Bottoms" in section 23. The streams of the "American Bottoms" pass into cavern-like openings developed in this sandstone, owing to the undermining of the sandstone by the weathering and solution of the underlying limestone, and the corrasion by the inflowing waters. The cave-like openings of these stream inlets are among the most striking phenomena of the entire region (Figs. 5, 6, and 7). On the ridges in the eastern part of the area, a number of broad, fairly extensive sags are developed on the Cypress sandstone between the gentle summits of the ridges. Examples of these are to be seen at Cincinnati and Tanner.

Golconda Limestone and Shale. Overlying the Cypress sandstone are about 20 feet of olive shales. This shale formation is seldom seen except beneath the overlying limestone, where it is protected from erosion. It may be considered as part of the Golconda limestone and shale unit. The Golconda limestone is poorly developed in the "American Bottoms" region. It usually consists of several ledges with intercalated thin shale bands, especially at the top; but occasionally the shale between the layers makes up as much of the thickness as the limestone. The Golconda limestone has been called the Upper Huron limestone, or the "Third" limestone of Indiana. The latter name refers to its position in the succession of limestones above the Mitchell limestone. Farther south it has a characteristic thickness of 30 feet, with thin shale members in the upper portion. It is a coarse, semi-crystalline limestone, often beautifully oölitic, and contains large numbers of crinoid stems, blastoids, and several species

of *Archimedes*, the latter usually in larger numbers than occur in any other Chester limestone of Indiana. In the "American Bottoms" region it is usually overlaid by a few feet of green shales where it is not cut out by the disconformity between the Mississippian and the Pennsylvanian. Toward the extreme southern end of the state, it is succeeded by a persistent sandstone of the Chester Series. This sandstone is not found north of the French Lick region. The Golconda limestone takes its name from Golconda, on the Ohio River in southern Illinois, where the limestone and shale are upwards of 80 feet in thickness.⁴ In the "American Bottoms" region there are nowhere more than 10 feet of limestone, and frequently much less. It is of little importance physiographically in this region. Where it appears in the accompanying shales above the Cypress sandstone, it has been included on the map under the convention used for the Cypress and other contiguous strata beneath the Pennsylvanian contact. The single symbol has been used because the disconformity is so marked that the Pennsylvanian strata are found in several places resting on beds well down in the Cypress, the Golconda formation having been entirely removed by the erosion preceding the deposition of the later strata. The stratigraphic column shown on the right of the geologic map indicates at what levels the disconformity may occur in the region.

The Pennsylvanian Strata. The Pennsylvanian strata exposed in the "American Bottoms" region belong exclusively to the lower part of the Pottsville, and are composed for the most part of coarse, gritty sandstone with some associated sandy shales and intercalated thin coal seams.

The Mansfield Sandstone. The Mansfield sandstone is the name given to the massive, cross-bedded sandstone at the base of the Pennsylvanian rocks of Indiana. Frequently the lower portion is represented by sandy shales which may contain a thin seam of coal. The disconformity referred to in the preceding paragraph allows the Mansfield sandstone or its corresponding shale to begin at various horizons from the middle of the Cypress sandstone up to a level perhaps 60 feet higher. In the latter case the Golconda limestone and

⁴ Charles Butts, Mississippian Series in Western Kentucky. *Kentucky Geological Survey*, 1917.

associated shales appear in the section. Farther east in the vicinity of Cincinnati, only the highest parts of the ridges are capped by the shales containing a thin coal, and the sandstones of the basal Pottsville. These strata reach lower levels to the west, the dip of the Pennsylvanian-Mississippian contact being considerably greater than the general westerly slope of the land surface. Consequently most of the western portion of the region is capped by the Mansfield formation.

The lower portion of the Mansfield consists locally of sandy shale, which usually contains a thin seam of coal; but typically the Mansfield is a coarse, often gritty, massive, decidedly cross-bedded sandstone with occasional streaks of sandy shale. The occurrence of the shaley phase containing the thin coal seam is not haphazard, but takes place where the erosion of the Mississippian has been greater, previous to the deposition of the Mansfield, than in the adjacent regions. That is, the shales and thin coal seams appear to have been deposited in local basins. Above the shales, the sandstone phase usually comes in and becomes quite characteristic of the Mansfield formation. Many cases are known where the sandstone rests disconformably on the green shale of the upper Chester. The Coal Measures in Indiana contain little or no olive shale. The massive sandstone on the ridge near Ridgeport is typical of the Mansfield formation as it occurs in the "American Bottoms" region. It is about 50 feet thick east of the village, and considerably thicker west. Its resistance to weathering and erosion is well illustrated by the higher elevation of the ridge west of Ridgeport where the Mansfield is excellently developed. It is well known that massive sandstones where well cemented must give rise to bluffs along streams, and that sandstones when they occupy the inter-stream areas, whether they are well cemented or not, cause sharp ridges of rather uneven crests. These features are characteristic of Mansfield sandstone topography.

The above discussion includes all of the Paleozoic rocks found in the region of the "American Bottoms". The remaining deposits belong to the Pleistocene and Recent periods. Since these latter deposits occur at various levels, and are concerned directly in the development of the physiography of the region, rather than indirectly as conditioning factors, they will be discussed under other headings below.

THE PRE-GLACIAL PHYSIOGRAPHIC HISTORY OF
THE REGION

The Significance of Land Forms. Having shown that the series of rocks exposed to the various agencies has given rise to a number of primary regional forms dependent upon the characteristics of the strata themselves, and the particular agencies at work, we may turn to the second set of conditioning factors mentioned in the Introduction. This second set of conditioning factors has been determined for the most part empirically by a study of the relations of the "American Bottoms" region to the wider territory of which it forms an integral part, a territory embracing the larger part of the Mississippi valley. The broad diastrophic impulses which have affected the Mississippi valley should be registered in the land forms of any unit area situated in such a central position as southern Indiana. It is maintained that any broad crustal change affecting a great interior continental basin, like the Mississippi valley region, will be recorded in land forms, and that this record will reach in measurable form the remoter parts of the area affected. The physiographic development of southern Indiana when finally read will not be essentially different from the history of the Mississippi valley as a whole, and, turning the statement around, the physiographic development of the Mississippi valley must harmonize with that of southern Indiana. Further, it may be generally stated that any adjustment which has been made by the master stream of a region must be recorded in the streams which are tributary to it. Yet no particular small area has squeezed into it the full physiographic data of the larger territory to which it belongs. Direct data from some one particular area may be applied to another by inference. The particular region here in question by no means has within itself its full readable physiographic development, yet it is being presented here as a representative unit in southern Indiana physiography, which, in turn, must harmonize with that of the Mississippi basin. In so far as any of the conditioning factors belong to the second group, viz., those dealing with crustal movements separated by periods of crustal stability, have failed to stamp the region with the characters which neighboring regions lead one to expect, by so far it

fails to maintain the qualities which a type unit in southern Indiana physiography should possess.

Whenever the physiographer searches over a region, whether in the field or by means of its representative, the detailed topographic map, he fixes upon certain salient forms which represent results that may be expressed in terms of denudational units. For example, monadnocks standing on bases which may now be no broader than the broader parts of inter-stream tracts bespeak the former existence of a peneplain. Trenched valleys below such a peneplain show that uplift of the region initiated another cycle of erosion; and local benches and sags in the older ridge may indicate a halt or series of halts in the general uplift of the region. Features of this sort may conceivably exist in a region, regardless of the nature of the rocks upon which the features are developed. Nevertheless it must be agreed that the nature of the material upon which these characters are impressed is a controlling factor, and that some rocks are favorable for preserving and revealing such historical monuments while others are not. We shall see how the region of the "American Bottoms" reveals periods of peneplanation, followed by uplift and other complicating associated processes.

The Kirksville Peneplain. The broad ridge beginning in the region of Cincinnati and trending northwest and then west between Beech Creek valley and the "American Bottoms", and the branch of this ridge running between the "American Bottoms" and Clifty Creek valley, are fairly broad with gentle undulations, and are never flat over any considerable area. The general elevation of this Cincinnati-Ridgeport ridge and its branch south of the "American Bottoms" is consistently 800 feet above sea level, but nevertheless it slopes gently toward the west. By consulting the geologic map one may see that the generally accordant level of the ridges is not due to denudation down to a certain resistant stratum, but that to the east the top of the ridge is in rocks of Chester Age, while to the west it is in rocks of Pennsylvanian age. It is proper to mention here the fact that this level persists over a series of high ridges to the east of this region, and that it is developed on various strata, and furthermore that it gradually rises to the east, but at a moderate rate, probably not more than 5 feet to the mile.

One must conclude that the Cincinnati-Ridgeport ridge and its branch between the "American Bottoms" and Clifty Creek, and also the end of the ridge between Clifty and Plummers creeks, as seen north of Kolean, represent the level of a former peneplain, which may be seen on the upland divides over the whole unglaciated portion of the state, reaching up occasionally to maximum elevation of 1,000 feet or more. There are places in the state where it is broad and plateau-like as compared with local peneplains or structural levels below, or the entrenched drainage channels. Some of these characteristics may be seen on the topographic map of the "American Bottoms" region. To this high former peneplain of southern Indiana, Beede has given the name Kirksville plain from its excellent development near the little village of Kirksville in Monroe County.⁵ It has been regarded as a correlative of the Lexington peneplain of Kentucky and the Highland Rim of Tennessee, and was probably developed in middle Tertiary times.

The Kirksville peneplain is the oldest peneplain represented in southern Indiana, and, so far as the physiography can be read from the topographic forms, must be used as a beginning of represented physiographic history; yet there is no doubt but that other peneplanations succeeded the withdrawal of the Pennsylvanian seas and preceded the development of the Kirksville. There is no physiographic record of the great lapse of time represented by the remainder of the Paleozoic, the entire Mesozoic, and the earlier part of the Cenozoic.

The Partial Erosion Cycle Succeeding the Kirksville Peneplanation. Succeeding the Kirksville peneplanation, the residual forms of which are found in the gently undulating, often broad, inter-stream spaces of the "American Bottoms" region, was an uplift which initiated an ensuing cycle of erosion. Whether the amount of this uplift is to be measured by the difference between the Kirksville level and the grade level of the present streams, or by more or less than this amount, we should be able to read from the resulting assemblage of topographic features. Close study of the region fails to reveal a consistent series of benches that may be

⁵ J. W. Beede, Features of Subterranean Drainage in the Bloomington Quadrangle. *Proceedings of the Indiana Academy of Science*. 1910.

positively called local peneplains, such as should have resulted had the amount of uplift been less than the difference between the Kirksville level and the present grade level. Certain broad benches do occur, but in every case they may be correlated with the particular strata upon which they are developed, since they are consistently present upon certain strata, and have their elevations corresponding exactly to the dip of the strata. Another criterion of local peneplanation which may be looked for is the presence of sags in the inner-stream ridges, developed at a fairly consistent level. One such is found at Ridgeport at an elevation of 735 feet, near the base of the Mansfield sandstone; another northeast of KOLEEN at an elevation of 705 feet, near the base of the Mansfield and in shale; a third at Tanner at an elevation of 735 feet; and a fourth, one-half mile southwest of Tanner at an elevation of 740 feet. These two latter are developed on the Cypress sandstone, and really mark the beginning of the more or less continuous line of benches above the "American Bottoms" valley developed on the same strata. Briefly, it may be said that these sags constitute the sum total of the evidence that local peneplanation above the present stream level and below the Kirksville level has taken place in the region, and that there is insufficient evidence upon which to base a claim of local peneplanation below the Kirksville level.

In other portions of the driftless area, conspicuous local peneplains are found below the level of the more ancient Kirksville plain. Beede⁶ has identified a wide-spread peneplain developed on the Mitchell limestone to the east of the "American Bottoms" region. This peneplain he named the Mitchell plain from its excellent development at Mitchell, Ind., on the Mitchell limestone of southern Lawrence County. It has an elevation varying from 100 to 175 feet below the Kirksville plain where both are present in the same region. Judged from its development exclusively on the Mitchell limestone it does not satisfy all the tests of a genuine peneplain. It has a fairly uniform inclination accordant with the dip of the limestone upon which it is developed. The writer has proved this by making several sections across it. In Harrison and Washington counties it seems to have been developed about the horizon of the top of the St. Louis limestone near

⁶ *Loc. cit.*, p. 26.

the cherty layer within the Mitchell limestone group. The writer is not in a position to discuss this point at present as fully as could be desired. Further study will either prove the Mitchell plain to be due to denudation down to a particular group of strata, or to be a true peneplain as described by Beede. Locally the Mitchell plain has all the characters of a true base-level plain, but it can be urged against this interpretation that the plain is well developed to the eastward at elevations consistent with the level of the Kirksville plain, while to the westward where the same Mitchell strata have dipped down, the plain also is much lower than the typical Mitchell level is supposed to be.

Judging from the development in Brown County, Ind., of a local gradation plain or peneplain below the level of the Kirksville plain, in rocks of uniform composition and structure and several hundred feet in thickness, it must be inferred that succeeding the Kirksville peneplanation there was a period of crustal stability after an uplift of about 150 feet. The Knobstone strata of Brown County are of such a character as to allow no benches to be formed as a result of local differences in the operation of physiographic processes upon different materials. The material is uniform over a wide area and thru great thicknesses of rocks, and therefore favors a uniform result. Moreover, the strata are of a shaly, silicious nature such as favors steep slopes, but does not permit the development of bluffs or cliffs. Weathering and erosion are strictly mechanical. For these reasons the conditions for the making and preservation of local peneplains are very favorable. The writer expects to make the details relating to this matter the subject of a later paper. The conclusion, however, which may be stated now is: first, that there was a short period of crustal stability after an uplift of about 150 feet, and that a gradation plane was then developed below the Kirksville level in Brown County; and, second, that since a wide area must have been subject to similar uplift followed by a period of quiet, the "American Bottoms" region probably had approximately the same history.

The absence of any topographic record of this short period in the "American Bottoms" region is tied up with the presence of a complex series of rocks upon which the physiographic agencies had to work. The period was so short that

its impress upon the variable strata must have been feeble, and a farther uplift and continued denudation have largely erased any such evidence as would clearly and conclusively show that there was in this region a stage of crustal stability below the Kirksville and above the present grade level of the streams. That there was such a period, the well-developed gradation plane in the Knobstone rocks of Brown County conclusively testifies. The Mitchell plain of the limestone area gives a similar but more equivocal testimony, as above noted. In failing to record such a condition, the region of the "American Bottoms" fails by so much of being a representative unit of southern Indiana physiography.

Further Uplift and Stream Trenching. So far as all appearances are concerned in the "American Bottoms" region, the uplift following the development of the Kirksville peneplain might have been commensurate with the difference between the Kirksville level and the grade level of the present streams. This difference is something like 225 to 250 feet, making proper allowance for the relief of the Kirksville peneplain itself. It is assumed that the present divides, which are the sole representatives of the Kirksville, were also the divides of the peneplain before uplift, and that the valleys of the latter were lower than the divides by an average of perhaps some 25 to 30 feet to the mile, a reasonably low estimation of regional slope where the drainage lines are small and their distance from the divides short, as is the case in the region under consideration. By way of comparison, it may be noted that the difference of level between the Kirksville plain and the present graded stream level in the Knobstone region of Brown County is about 275 feet, measured at places where the present streams are comparable in size to those of the region under discussion. This shows no disparity in the figures. It may be concluded, therefore, that the stream trenching which is characteristic of the unglaciated portion of southern Indiana is excellently represented in the "American Bottoms" region.

Valley Filling. The question may well arise whether stream trenching below any local peneplain level, or below the Kirksville, as it is represented in the "American Bottoms" region, may not have gone deeper than the present base level. If so, the total uplift has been greater than is evidenced by

the present grade level of the streams. The broad valley flat in the lower course of Beech Creek and the much broader valley of Plummers Creek suggest this. No records of the depth of the alluvium were obtained in either of these valleys, but it is noticeable that these stream valleys are filled valleys, and that nowhere in their middle and lower reaches do they flow over bed-rock. Their gradients are also low and well adjusted. Clifty Creek cannot be used as an example since it runs over bed-rock on account of having been deflected from the course it formerly followed. This point will be discussed later.

When it is realized that all the major valleys of the southern part of the state have the characteristics of filled valleys, it will be seen that this question is an important one. Numerous records show that the major streams are now flowing from 50 to 150 feet above their bed-rock floors. The fact that the largest of these streams are incapable of bed-rock scour beyond a depth of 40 to 50 feet eliminates any suggestion that these great depths of alluvium are the normal flood-plain material which may be entirely shifted and reworked by the waters of the streams even in the passage of their highest flood waters. There are two explanations that may be offered to account for valley filling. These will now be discussed.

Valley Filling Interpreted as a Result of Regional Depression. Valley filling in southwestern Indiana has long been recognized as one of the chief characteristics of its physiography. Ashley, in his description of the topographic types in southwestern Indiana, reaches some very interesting conclusions in this regard.⁷ In comparing the characters of the the stream valleys of the middle section with those of the western area, he uses Twin Creek, Washington County, and Big Blue River as types of stream valleys of the former area, and Pigeon Creek as a type of the latter. He says in part:

Twin Creek has along its course steep, precipitous banks. Pigeon Creek has well-rounded banks, nearly everywhere suitable for cultivation. Twin Creek has broad bottoms, but evidently carved out of the rock by erosion, the creek bed being everywhere in rock. Pigeon Creek's broad bottoms are evidently due to the filling of sunken valleys. . . . In brief, the area in which Pigeon Creek lies has evidently sunk below drainage level so that all the valleys have been filled

⁷ G. H. Ashley, *The Geology of the Lower Carboniferous Area of Southern Indiana*. 27th Annual Report of the Indiana Department of Geology and Natural Resources. 1902.

up so the streams have been raised so that they will run off again. At that point (just east of Ash Iron Springs) the sinking has been estimated as not less than 100 feet.

Turning again to the region of Blue River it is at once evident that the region has not suffered the same depression as had occurred to the west. On the contrary, the evidence is quite strong that the Blue River region has recently been uplifted.

Thus, it appears that Ashley explains the valley filling to the west as due to depression, and at the same time gives facts to show that farther east uplift has occurred. He further states that the great width of the Ohio River valley below Cannelton as compared to its gorge-like appearance above is due to recent uplift to the eastward.

Newsom,⁸ speaking especially in regards to the topography of the Knobstone rocks in Washington County, has the following to say:

It will be noticed that these streams, after having cut through the overlying limestones, have in all cases quickly cut down to their present base levels of erosion, and that the main streams, especially Rush and Delaney creeks, flow through flat-bottomed valleys. As their topography indicates, these are silted up valleys in which the alluvial filling is from 20 to 40 feet thick.

This silting has been brought about by a depression of the land from a former higher elevation, when the valleys were eroded more deeply than at present. With the depression of the surface the streams gradually became checked and the valleys filled. All of the main tributaries of East White River in southern Indiana flow through valleys that have been filled in this manner from 20 to 60 to 75 feet.

Beede⁹ in summarizing the physiographic history of the Bloomington Quadrangle, which lies immediately east of the "American Bottoms" region, states that the present streams flow at a level somewhat above the rock floors of their valleys on account of depression following a period of erosion when the stream valleys were trenched below their present floors. Numerous citations from the publications of such students of the Mississippi valley physiography as Glenn, Salisbury, Hershey, and others might be made, in which valleys filled with gravels, sands, and silts to depths of 100 to 150 feet or more have been described, and this peculiarity explained as due to the depression of the land.

⁸ J. F. Newsom, Geologic Section Across Southern Indiana. *27th Annual Report of the Department of Geology and Natural Resources*. 1902.

⁹ J. W. Beede, Features of Subterranean Drainage in the Bloomington Quadrangle. *Proceedings of the Indiana Academy of Science*. 1910.

It is conceded that valley filling would be the result of regional depression, and such an interpretation of valley filling in southwestern Indiana and associated regions is a most natural and simple one, especially when looked at from the standpoint of any limited region. But when the question is considered from the standpoint of the entire area affected, other causes than regional depression are suggested. These causes call into account processes, which, if not now in operation, have undisputably been in operation in the past, and were in themselves alone capable of accounting for the filled valleys in southwestern Indiana. This alternative explanation will now be discussed.

Valley Filling Interpreted as a Result of the Seaward Extension of the Master Stream. Large streams, like the Mississippi River, which carry enormous quantities of sediment and empty directly into a great embayment of the sea, must in the course of time change their regimens markedly. Such streams must always maintain a grade that will permit them to carry their burden to the sea. The Mississippi river is contributing enormous quantities of material to the Gulf, but at present there is little extension of the delta seaward on account of the intensity of wave action on the now altogether peculiar, slender, protruding delta of the main distributaries. This peculiar, protruding, crow-foot delta, perhaps now somewhat artificially encouraged in its idiosyncracies, is added to the generally protruding deltaic land. If there should be ever so little extension of this delta seaward, there would necessarily be an adjustment of the entire graded portion of the stream to fit the extended stream, since the present load capacity of the stream is delicately adjusted to the grade. In other words, the grade must be maintained, and any extension of the stream must result in the synchronous building up of the stream bed as far back up stream as the graded condition prevails.

The fact that the master stream of the great interior plains of the United States has always emptied into an embayment is of considerable importance in relation to the physiography of the area. It is possible that the Gulf Embayment area may have been a deep arm of the Gulf basin extending northward, and that it has gradually been filled by the debris which the Mississippi River system has contributed

to it. It more likely has been for the most part an epicontinental sea, which has from time to time subsided perhaps in response to the load of land waste from the interior plains. The embayment has been gradually crowded more and more toward the gulf basin until the ultimate result has been to extend the land out into the gulf. This has been the work of the master stream of the great interior of the United States. It would appear that this delta building, which has resulted in extending the land seaward, has been slowed down from time to time by depression of the lower part of the area. Data at hand show that the Mississippi valley is filled with Pleistocene and post-Pleistocene material to a depth of about 250 feet below the present valley surface at the junction of the Ohio with the Mississippi, and that farther south the filling is to be measured in hundreds of feet, probably not less than 900 or 1,000 feet in the region of New Orleans. It would appear that for the most part, if not altogether, the depression has been confined to the immediate axis of the embayment and that it has there been fairly sharp. Streams paralleling the Mississippi River on either side do not seem to have filled valleys. Pearl River in Mississippi is an instance. This stream does not appear to have any more valley alluvium above its bed-rock floor than it is itself capable of moving.

The present delta of the Mississippi River begins near the mouth of Red River. Here occurs the branching off of the first distributary. This position is 315 miles by channel from the mouth of the river, and has an elevation of approximately 50 feet A.T. The channel could be shortened by 100 miles by eliminating all the crooks and oxbows. The stream channel, however, is no more winding than it normally should be. The head of the present delta is some 125 miles north of the gulf, in a straight line. It is conceivable that this position was in no very remote past the sea-level mouth of the Mississippi River. Lyell¹⁰ in discussing the convergence of the deltas of the Red River and the Mississippi, says in part: "The date of the junction of the Red River and the Mississippi would, in all likelihood, have been known, if America had not been so recently discovered." It is quite certain that the present delta is the work of continual deposition of ma-

¹⁰ Charles Lyell, *Principles of Geology*, 1873. P. 482.

terial which had been brought from the land mainly by the master stream. The present delta head is some distance in the interior, but, assuming that at one stage in the history of the embayment area the mouth of the Mississippi River was near this position, the Gulf waters once extended northward in a broad shallow embayment to this position. With the southward extension of the delta into this embayment, the graded portion of the stream had to adjust itself to the new condition. This was done by building up the stream bed, which in the course of time resulted in filling up the entire valley. Since the delta continually extended the river southward, the valley at the delta head was continually being built up. Today it stands 50 feet above sea level. Likewise the valley was filled up to a corresponding depth as far back up stream as its grade had previously been perfected. The graded condition of the streams extended well into southwestern Indiana. Thus the extension of the present delta of the Mississippi River in itself will account for a filling amounting to something like 50 feet. The vital question here is: Just where is the real head of the Mississippi River delta; that is, just where was it originally in the Gulf Embayment area?

An important feature to be considered is the date of the valley filling. This refers to the time when the chief delta extension took place. Mississippi valley physiography is intimately associated with the Pleistocene glaciation. The repeated extensive glaciation of the upper portion of the valley where the major tributaries have their origin has determined almost wholly the present features. Bordering regions give a time check on the Pleistocene epochs. The lower Mississippi valley was greatly affected by glaciation. One of these effects is the associated loessial deposits. A chief effect must have been the bringing down of great quantities of debris by the glacial waters. The coming of the glacial ice from the north with its successive loads of debris and its attendant fluvial waters obliterated to a large extent the pre-glacial drainage systems, and gave rise to new ones, or greatly modified or enlarged the old ones, with waters centered in the master stream toward the head of the Gulf Embayment. The result was the extension of the Mississippi delta into the Gulf Embayment by enormously rapid delta building.

lengthening this master stream during the Pleistocene by several hundred miles. Streams that previously emptied into the trunk stream, and which had been graded in conformity with a sea-level base toward the head of the Gulf Embayment, now had to readjust themselves to a trunk stream that had built or was building its bed high above its original level at the place of its former entrance into the sea. It is quite likely that the delta building of the master stream caused the entering streams to build up their beds and valleys 100 feet or more in their middle and lower well-graded courses.

This process of delta extension and attendant valley aggradation lasted thruout the Pleistocene, and into Recent times. The delta has extended itself at present so far beyond the original embayment that wave erosion is probably too severe for the process to continue. It is contended, however, that the chief delta building was during the early ice advances. It is thought that the Wisconsin glacial epoch contributed little to actual delta extension. Notable deposits, however, must have been made. The Wisconsin valley train is a rather feeble one at the junction of the Ohio with the Mississippi, probably less than 30 feet thick. This latest ice advance nevertheless did contribute to valley filling in that it gave rise to a peculiar system of lakes in the tributary streams, due to the valley train and glacial flooding in the master stream. Shaw¹¹ has described this laked condition of the tributary streams and assigned it to the Wisconsin glacial epoch where it undoubtedly belongs. Shaw, however, states that valley filling amounts to about 150 feet, but shows that the condition which gave rise to the lakes could not account for more than 40 feet. He dismisses the effect of delta extension as inconsequential, and makes no attempt to apply it beyond the Wisconsin glacial epoch.

The following direct evidence indicates the time of valley filling. In collecting data with respect to the occurrence of coal seams in the region of Eel River valley in southwestern Clay County, Ind., J. G. Liston, of Lewis, Ind., has obtained a large number of drill hole records. A large number of these show that Eel River is a valley filled 100 feet or more above its bed-rock floor. A few of these records show that

¹¹ E. W. Shaw, Newly Discovered Beds of Extinct Lakes in Southern and Western Illinois and Adjacent States. *Bulletin 20, Illinois State Geological Survey.* 1915.

in places over the old valley the Illinois glacial till was deposited on top of the valley-fill material. Thus, along Eel River the material which fills the valley is at least middle Pleistocene in age. This harmonizes with the idea that most of the delta building of the Mississippi River in the Gulf Embayment occurred in the earlier part of the Pleistocene.

Should the entire Mississippi valley be depressed 100 feet, the Gulf waters would extend as an embayment up the lower Mississippi valley as far as the north line of Louisiana, about mid-way between Greenville and Vicksburg. The lower 575 miles of the present Mississippi River would be submerged. This submergence would allow the Mississippi River to entrench itself not less than 30 or 35 feet at Cairo and the entrenchment near the mouth of the Wabash would be somewhat like 40 feet. This cutting down would take place because of the greater proximity of the interior regions to the sea in comparison to the present distances. It simply means that the low grade of the lower Mississippi would be transferred into the interior regions whereas the present grade is fairly high in comparison. The grade of the lower Mississippi would be transferred some 500 miles farther into the interior. Thus, a moderate depression of the Mississippi valley would not result in valley filling as is ordinarily postulated, but would result in valley cutting, just the reverse of the ordinary interpretation. In order to account for valley filling by regional depression care must be exercised in choosing the sort of depression to be postulated, and limits must be set to its application. It is only logical to infer that should the mouth of the Mississippi have been at a position near the north line of Louisiana, the well-graded streams of the middle interior Mississippi valley, like those of southwestern Indiana, must have flowed some 100 or 150 feet lower than at present, and the extension of the Mississippi River by delta building, or by some other method, must have caused the filling up of the valleys as we see them today.

The two interpretations of valley filling in southwestern Indiana outlined above have been presented rather as if either one alone could account for the phenomenon. The intention, however, has been to emphasize the latter one, but not to such an extent as to preclude any other interpretation. There is considerable evidence of differential crustal movements of a

minor nature thruout the Mississippi valley. The chief movements that have occurred since the middle Pleistocene have as a whole been slightly upward, tho there are some indications of tilting. Everywhere beyond the influence of the conditions which gave rise to valley filling, the present streams are cutting their valley floors. It appears that instead of the valley-fill material gradually thinning out up stream, it thins rather abruptly, and streams are cutting their bed-rock floors where they might be expected to have filled valleys. The Cumberland River illustrates the general condition, Near its junction with the Ohio River, this stream valley is filled not less than 175 feet deep, but in the vicinity of Nashville, Tenn., barely more than the beginning of its middle course, the stream is eroding its bed-rock floor. Numerous other similar instances might be given. This condition indicates that uplift has been differential or that tilting has occurred. This condition is not out of harmony with the principle of valley filling due to the extension of the Mississippi River by delta building.

General View of the Topography and Relief before the Advent of the Illinois Glacial Lobe. Near the close of the pre-glacial physiographic development of the "American Bottoms" region, the ridges between the deep stream valleys probably appeared somewhat as they do now, tho perhaps slightly broader. The area was sharply trenched by the main streams, and their ravine-like tributaries began with rather abrupt, steep gradients, as they do today on the south side of Beech Creek valley. Ray's Cave spring and all the other springs coming from the greatly enlarged joints of Beech Creek limestone along Beech Creek valley were well developed. A stream valley similar to the upper course of Clifty Creek valley traversed to "American Bottoms", and passed to the southwest thru the southeast quarter of section 27, and entered pre-glacial Clifty Creek near the center of section 34. Clifty Creek valley, instead of following the tremendous meanders seen in section 35, passed directly west thru sections 35 and 34, and turned southwest into Plummers Creek valley in the northwest quarter of section 4, about one-half mile east of Mineral City. Some 75 feet above the valley of the stream which traversed the site of the present "American Bottoms", the Beech Creek limestone outcropped, and

had developed in its small caves in the greatly enlarged joints. Springs flowed from these small caves thru steep gorges with rock-walled heads, similar to the one at Ray's Cave today. Thus, it will be seen that the "American Bottoms" region has a mature topography with a relief very much like that of the Beech Creek portion of the "Bottoms" and the vicinity of the upper part of Clifty Creek. The youthful condition now characterizing the "American Bottoms" had not yet come into existence, and the drainage of that portion was very different from the present.

Summary of Pre-glacial Physiographic Development. The pre-glacial physiography of southern Indiana may be summarized as follows:

1. A long-continued period of erosion gave rise to a widespread peneplain. This peneplanation was probably completed in middle Tertiary times. The peneplain developed in southern Indiana is called the Kirksville plain. The broad undulating ridges rising near the 800-foot contour represent the Kirksville peneplain in the "American Bottoms" region.

2. An uplift followed amounting to 150 feet or more in the Indiana region adjacent to the "American Bottoms" and widely affected the Mississippi valley.

3. The Kirksville peneplain was trenched by streams, and gradation planes and local peneplains developed in regions of unresistant strata. This stream trenching is well developed in the "American Bottoms" region; but gradation planes or local peneplains do not seem to have been produced.

4. The erosion cycle when well begun was interrupted by further uplift, amounting to some 250 feet or more in southern Indiana adjacent to the "American Bottoms" region.

5. The streams were then incised in response to the rejuvenation of the land, and the main streams were cut from 0 to 150 feet below the level of the present valleys. The mouth of Plummers Creek, some 3 miles west of the "American Bottoms" region, must have been cut at least 100 feet below the present valley level.

6. A period of valley filling ensued, and the valleys were filled from 0 to 150 feet or more in the middle Mississippi valley region. This valley filling has ordinarily been interpreted as the result of regional depression, but an alternative view is suggested here to the effect that the valley filling has

taken place on account of the extension of the mouth of the Mississippi River several hundred miles southward from its position in early Pleistocene time. This extension was brought about by the glacial floods, mainly, which in the Pleistocene period descended from the north.

THE PHYSIOGRAPHIC INFLUENCE OF THE ILLINOIS GLACIAL LOBE

General Obstruction of the Streams in Front of the Illinois Glacial Lobe. The third and fourth conditioning factors in southern Indiana physiography, as stated in the introductory part of this paper, are glaciation on two sides of a triangular unglaciated area, and the fact that the main elements of drainage are almost exclusively to the west and south and that this drainage bears a peculiar relation to the glaciated parts on the two sides of the unglaciated part. These two factors which give form and expression to the area here involved are treated together, tho only the first mentioned one is an active factor or involves active factors.

The ice of the Illinois Glacial Epoch pushed in from the west and northwest upon the drainage systems leading toward it on the one hand, and on the other it pushed in from the east and north down the drainage systems leading away from it. Thus, there are only areas of inconsiderable size entirely immune from the influences of the Illinois Glacial Lobe in southern Indiana. Any particular area must be considered with respect to its relation to the particular glacial flank controlling its modification. The "American Bottoms" region is located on the west, and consequently the great ice and debris barrier invaded from the west and north into the drainage systems leading toward it. The streams of the region are not thru streams; that is, they are small and head in the unglaciated region only a few miles from where they flow against the position of the ice front.

It may be noticed that the glacial ice advancing from the west and northwest vigorously over-rode the pre-glacial valley of the west fork of White River, having crossed it everywhere almost at right angles, and that it advanced several miles beyond, going somewhat farther to the south than to the north. In transgressing somewhat beyond the pre-glacial White River valley, it advanced up the drainage lines coming

in from the east, blocking them very effectively at the time with ice and ice-borne material. This condition of blocked drainage, which in a number of instances persisted after the ablation of the ice, is everywhere in evidence along the former position of the ice front. Streams in a number of cases follow their pre-glacial course to near the position of the ice front and then change their course to some position that gave a favorable outlet to their waters previous to the melting of the ice. Others persist to the White River valley, showing only the effects of the temporary blocking of their courses. The smaller pre-glacial streams and ravines back of the position of the ice-front were for the most part obliterated by the over-riding ice with its burden of till and the glacio-fluvial deposits that characterized the ablational period. Leverett¹² describes briefly the temporary ponding and the permanent obstructions of the stream valleys heading beyond the former position of the ice front. Among the most striking derangements of drainage and ponding of pre-glacial valleys are those south of the east fork of White River, namely the Patoka River, Pigeon Creek, and others. North of the east fork of White River, Leverett discusses the following in order from south to north: Furse Creek, Richland Creek, the "American Bottoms", Raccoon Creek, and "Flat Woods".

Stream Damming in the "American Bottoms" Region. The geologic map of the "American Bottoms" shows the approximate area covered by the glacial invasion. It is impossible to show accurately the farthest actual advance of the ice itself. The criterion indicating the actual presence of the glacial ice itself *en masse* is boulder clay. The line on the map marking the approximate position of the front of the Illinois Glacial Lobe is drawn where the easternmost patches of boulder clay are found. The line runs nearly due south from the mouth of Beech Creek across the area, passing somewhat west of Park, and passing Plummers Creek about midway between Kolen and Mineral City.

In connection with the blocking of the drainage lines leading from the unglaciated area to the ice front, great quantities of material were carried locally by water coming from the ice margin itself, sweeping the ice-contributed debris

¹² F. Leverett, The Illinois Glacial Lobe. *Monograph XXXVIII, U.S. Geological Survey*, 1898-99. Pp. 97-195.

farther inland than it could ever have been brought by the ice alone. The morainic material has everywhere been carried by the glacio-fluvial streams beyond the actual position of the ice-front. Occasionally debris has been carried in this manner several miles beyond the position of the ice front. Locally great outwash aprons occur, covering several square miles. In the re-entrants between these expansions of outwash material there may be for a number of miles along the ice margin comparatively little material of this sort. These local expansions of outwash material have frequently nearly obliterated all the pre-glacial surface irregularities, and their fairly even, eastwardly sloping surfaces may still be seen descending from near the former position of the ice front. These fans are now deeply trenched by post-glacial erosion. Such an outwash fan occurs near the viaduct of the Illinois Central railroad across Richland Creek, north of the mouth of Beech Creek, and just outside the mapped area. Another one is beautifully developed south and east of Park. It would seem that broad sheets of water must have made this outwash deposit of ice-contributed material, carrying it eastward two or more miles. The sharp ravines and cuts next to the glacial margin frequently expose layers of coarse gravel inter-bedded with coarse sand. Farther east the gravel disappears, and only the sand, very much cross-bedded and rudely stratified, is seen in the sharp ravines and cuts. Much of the original surface of this outwash fan is excellently preserved in sections 26, 27, 34, and 35. Its gently sloping surface shows very clearly on the topographic map, tho deeply trenched by post-glacial erosion.

This outwash material in places almost completely obliterated the pre-glacial topography. A small monadnock-like hill one-half mile southeast is completely surrounded by stratified sand. It would appear that this hill of Mansfield sandstone stood island-like in the floods which swept the sands about and beyond it. The pre-glacial valley of Clifty Creek in the eastern part of section 33, and thru the middle of section 34 was completely filled; and farther east in section 35 it was filled from bluff to bluff to a depth of 100 feet or more. It is easily seen that Clifty Creek never recovered this drainage, but sought an outlet to the southwest across the ridge thru section 3. The line of the former discharge can be de-

terminated by noting the position of the outwash deposits shown on the geological map. The stream that came in from the pre-glacial "American Bottoms" valley was likewise filled, and, while its lower course has been partially resurrected, much of the old valley is still a sandy flat into which the rain waters readily sink instead of flowing over the surface. The southwest edge of the "American Bottoms" in section 26 is a flat surface of a portion of this outwash plain. The sand of which it is largely made up is exposed in the south-flowing stream and ravine-like tributaries near the line between sections 26 and 27.

Just north of Park there is a broad glacial col. It seems that the water from the ice came from the west over this col and was discharged to the southeast thru section 27, probably finding its way out toward Plummers Creek along the route of the present Clifty Creek. Proof of the eastward discharge of water thru this col is found not only in the direction of flow indicated by the cross-bedding of the water-laid material, but also in the presence of silt terraces due to the ponded condition of the northeast tributary of Ore Creek, in the north half of section 22. These silt terraces are at exactly the same elevation as the broad glacial col. This small pre-glacial valley leading southwest was ponded by the ice and glacial debris to the depth of the water flowing out at the col. The glacial sediment which eddied into this flooded pre-glacial valley combined with the indigenous material carried into it by the regional wash to fill the valley with silt, the remains of which still reveal its glacial history. It is quite probable that the strong discharge over this col resulted in lowering the head of the outwash apron in the vicinity of Park.

The outwash material so effectually filled the lower part of the valley now occupied by the "American Bottoms" that the waters which gathered into it have never transgressed the barrier. The middle and upper part of the valley became a lake with the lowest margin at an elevation of 675 feet above sea level. The southwest rim was the broad outwash plain gently rising to the west. This outwash plain abutted against the abrupt ridge to the south. There are no indications that the water of the lake ever overflowed the barrier at any point.

The lower course of Clifty Creek, as has already been explained in some detail, was also evicted from its pre-glacial channel. The lake produced in its middle and upper reaches extended to within a short distance of the village of Cincinnati, and the waters rose to an elevation of about 650 feet. At this elevation the water evidently found an outlet across a sag in the ridge to the south, and the draining stream debouched, as it does today, nearly one and one-half miles farther up Plummers Creek than in Pre-Illinoian time.

Both Plummers and Beech creeks were also dammed by the ice. These streams still discharge thru their pre-glacial valleys. The presence of silt terraces in the valley of the former, some 40 feet above the present valley flat, indicates that it must have been effectively dammed for a time, but that the barrier was not sufficiently massive to derange the drainage permanently. In the lower part of Beech Creek valley the terraces rise about 50 feet above the present valley floor, and their presence far up the valley at a consistent elevation of 600 feet shows that the valley was effectively dammed to that height; but this again was not enough to derange the drainage permanently.

The close of the Illinois glacial invasion in the region of the "American Bottoms" found Plummers and Beech creeks ponded some 40 to 50 feet deep, with their waters rising to a level of a barrier that remained long enough to permit the lakes to be filled up by the incoming debris from the drainage basins above. Clifty Creek valley was so effectually obstructed that the water in the glacial lake found an outlet approximately 100 feet above the valley of Plummers Creek. The pre-glacial valley of the "American Bottoms" was also blocked to such a height that the waters confined in its middle and upper portions never overtopped the barrier. The surface of this lake must have had an elevation of not less than 650 feet and not more than 670 feet above sea level.

POST-GLACIAL PHYSIOGRAPHIC WORK AND READJUSTMENT

Removal of the Pleistocene Deposits. The post-glacial history of the "American Bottoms" region is concerned chiefly with the removal of the material contributed by the glacier to the pre-glacial valleys, and with the adjustment of the

drainage to changes for which the presence of the ice on the west was responsible. The removal of this glacial material proceeds in two ways. One of these is the removal of the silt deposits from the floors of persistent pre-glacial stream valleys, and the other is the removal of deposits by the trenching work of post-glacial streams.

In the cases where the drainage lines were not changed, but were temporarily laked, the process has not been so simple as has often been supposed. The streams have not simply sunk down into the lake-like silts and removed the deposits by broadening their valleys, leaving the local unremoved portions as terraces. Plummers and Beech creeks have been at grade level for a long time, but it has been a progressively changing grade level. Their present valleys are wide and the stream channels meander in them. These features are indicative of base level. The presence of the lacustrine deposits as local terraces of fairly uniform height here and there above the present valleys indicates the Pleistocene level of the streams. The Beech Creek terraces are about the same height above the base level as those of Plummers Creek. The similarity of the Pleistocene terraces along the minor streams near where they enter White River valley suggests a common cause. The large number of terraces 40 to 50 feet high, such as those of Beech and Plummers creeks, are not due to mere local laking of the particular valleys, but rather to a more general laking. The purely local filling of these streams has been insignificant. There are a number of cases, however, of local filling, and the results have been far from uniform. The ponding of the stream valleys in such a manner as to produce a uniform effect in so many cases can be ascribed only to the superior height of the main stream above its former base level. The occurrence of terrace remnants along both forks of White River accordant in height with those in the tributaries is quite common, but such terraces are not so common as those in the tributaries. Thus the terraces in Beech and Plummers creeks are due to the cutting out of the Pleistocene filling, except at locally protected places. These terraces had their cause in the great valley train of White River, which has since been largely removed. The removal of the Pleistocene silts, then, was not due simply to the cutting down of individual streams into their deposits, followed later

by broadening of the valleys by lateral corrosion; but it was caused by the slow reduction of the valley train of the main stream, and it took place almost entirely as the streams cut down their valleys, always retaining a broad graded surface. The terraces according to this explanation have always stood out higher and higher above the local base level, as the down-cutting of the main stream allowed the base level of the minor streams to be let down. These in the future will stand higher than they are at present above the wide valleys, as there is no doubt but that the steep gradient of the west fork of White River must be considerably reduced, tho the great load the stream has to transport will allow its middle and lower portions to be reduced only very slowly.

The removal of the glacio-fluviatile deposits by the development in them of ravines and streams since their deposition is mainly occurring in places where the pre-glacial valleys were obliterated or permanently obstructed. To a minor extent, however, removal in this manner takes place in the silted-up pre-glacial valleys the streams of which still maintain their original courses, as the many small tributaries in the terrace deposits along some of these valleys testify. The deposits which are undergoing the action of post-glacial streams are mainly in valleys where the pre-glacial drainage lines have been more or less completely destroyed. The lower part of the pre-glacial Clifty Creek valley and the pre-glacial valley of the "American Bottoms" are illustrations of this type of removal. Here the filling has been due to special rather than general considerations. No two such filled valleys need be very similar, especially as regards depth of filling and the readjustment of drainage necessary to meet the derangement that took place. In the two valleys that serve as types, it will be noted that the filling was due to a local barrier in the form of an outwash plain. There are many other similar cases.

The sandy outwash deposits in the completely or partially filled pre-glacial valleys are easily trenched by the streams. The stream heading about one-half mile south of Park has broadly removed the outwash sand and gravel in a pre-glacial tributary of Clifty Creek, and then turned down the pre-glacial Clifty Creek valley itself. Many sharp precipitous ravines occur as its tributaries. Most of those which have

their origin in sand have broad seeps at the foot of their steep slopes because of the permeability of the sand plain above.

Development of Post-Glacial Clifty Creek. Clifty Creek valley has been deeply excavated since Pleistocene time and has developed some unusual characteristics inherited from the period of adjustment subsequent to the ablational period of the ice. Its line of discharge after passing out at the middle of section 36 was up the pre-glacial valley of Little Clifty Creek for a short distance, high above its present level. It then curved westward and then to the north where it described an unusual ox-bow, returning to within 125 yards of itself, but continuing on southward and touching the north edge of section 2 before bending back into another ox-bow with a southwardly directed loop. In the first large loop about the center of section 35, it passed over the position of its filled pre-glacial valley, but on turning back from this loop it never again encountered the old valley. After having made an unusually striking double loop in the southwest quarter of section 35, it at first took a course in a generally southwest direction thru a sag in the ridge that formerly separated its valley from that of Plummers Creek. This consequent stream must have flowed at an elevation of approximately 650 feet above sea level, or 90 feet above its present level in the southwest part of section 35. After entrenching itself some 10 feet below this level it remained stationary for a long time, allowing the pre-glacial portion of the stream, the part above the mouth of Little Clifty Creek, to become silted up with the incoming material from the surrounding area. Since then the stream has slowly cut downward, and the silt of the middle and upper parts of the valley has been largely removed. The great meanders in section 35 were entrenched *in situ*. The northwardly intended meander in section 35 has become greatly enlarged on account of having been formed in the pre-glacial filled valley. The outside of this meander has always been a bank composed of unconsolidated sand. The stream today still swings against this sand bank on the western and southern sides, and the numerous sand slides carrying in the vegetation testify to the continued growth of the meander. The next meander looping broadly toward the south was also probably smaller originally, and has been

cut considerably on the outside where the stream is being entrenched. The present stream fits snugly against a rock wall of Cypress sandstone. It is likely that the other meanders have been somewhat enlarged also.

Clifty Creek in its initial post-glacial course was perhaps everywhere working in the unconsolidated material of section 35, but on cutting down it came to the underlying bed-rock, except here and there. Wherever it has become entrenched in bed-rock, it is now gorge-like. The wide pre-glacial valley flanked with terraces comes to an abrupt end at a gorge just below the mouth of Little Clifty Creek. The present stream has no valley flat here at all, but flows between rock walls composed of Beech Creek limestone below and Cypress sandstone above. This gorge, which is not a pronounced one, ends rather abruptly, and for a short distance the valley widens out to considerable dimensions. The constriction between the rock walls is repeated where the stream turns north at the beginning of the great meander loop about the middle of section 35. The temporary increase in width just mentioned is due to a small pre-glacial valley which emptied northward into the pre-glacial valley of Clifty Creek. The northward loop, as already described, has a wide valley because here the stream worked in unconsolidated outwash material which has filled the pre-glacial valley. The stream in this very striking meander loop enters into a rock-walled gorge again just south of the center of section 35. The water here is flowing with considerable velocity over a bed-rock floor. After swinging around this northward loop the stream returns to within 125 yards of itself; but the short distance between the two limbs of the meander is separated by a high sandstone ridge. In making the broad southward loop the stream encounters a small, fairly broad pre-glacial valley trending northward, and follows the latter to the northward. On rounding this meander the stream hugs a steep cliff of Cypress sandstone. This turn to the northward is due not only to the presence of the pre-glacial valley, but also to the height of the ridge to the west. The initial stream flowed northward until the height of the ridge lessened sufficiently to permit it to cross. It did not come quite far enough at this place to reach the pre-glacial valley of Clifty Creek. Initial flow to the northward was

unfavorable because the outwash surface had a southward slope. Clifty Creek follows a double meander thru a rock-walled gorge in the southwest corner of section 35. The lower part of this gorge is in the Beech Creek limestone, and the upper part in Cypress sandstone (see Fig. 2). The gorge here has walls about 50 feet high and a much higher steep ascent on the south. The bed of the stream is in highly jointed limestone, and the stream continues to run over or very close to bed-rock thru the remainder of its course to Plummers Creek valley, as shown on the geologic map. The topographic map shows excellently the post-glacial gorge which Clifty Creek has made. Its restricted width here in comparison to its pre-glacial valley is one of the striking features of the region.

One of the remarkable conditions to which this adjustment of drainage has given rise is the present tendency of the stream to seek a subterranean channel. This is an adjustment that belongs to the present (see Fig. 3). Only the flood waters of Clifty Creek go around the broad double loop to the north. The regular flow all passes beneath the ridge along the enlarged joints of the Beech Creek limestone, coming out on the other side in a small cave-like opening. This underground passageway is one-fourth of a mile in length, and the ridge reaches a height of nearly 150 feet above it. When the flood waters give sufficient pressure, water comes out on the lower side thru numerous openings, and thru some of the smaller ones, spurts out fountain-like from the limestone wall.

Development of the "American Bottoms" Drainage. The filled valley leading from the "American Bottoms" has a consequent drainage developed since the fill was made. One of the ravines heads at the col near Park. It descends very steeply into the outwash sand, and to the southeast joins a larger stream which comes from the north. The east side of this larger stream is formed by the exposed wall of Cypress sandstone which was also the east side of the pre-glacial valley leading out of the "American Bottoms". The west side of this valley is composed of sand and gravel from which water continually seeps, locally making boggy places at the foot of the steep slope. This stream crosses the pre-glacial Clifty Creek valley at right angles and joins the present

Clifty Creek just beyond the south side of the old valley. The stream turns southeast upon striking the rock wall of Cypress sandstone just before it enters the present Clifty Creek. The



FIG. 3. Where Clifty Creek is now becoming subterranean, near the southwest corner of section 35. The Cypress sandstone here comes down slightly below the creek level. Photograph by P. B. Stockdale.

valley has considerable width where it crosses the old filled valley. The topographic map shows this widening of the valley quite distinctly. In the extreme southeast corner of section 27 the main re-excavating stream from the north in

its downward descent came upon a "nose" of the bed-rock ridge, but kept its position, and cut a gorge at that point in the Cypress sandstone (see Fig. 4).



FIG. 4. Post-Illinoian stream-gorge in the southeast corner of section 27, where the stream from the north passed over a portion of the buried part of the ridge at the side of the pre-glacial valley. Photograph by P. B. Stockdale.

We have already seen that the "American Bottoms" is a filled valley, due to the spreading of an outwash apron which obstructed the lower part of the valley completely.

The middle and upper part of this valley became the site of a lake into which the waters came from all sides, bringing in silt and filling the valley back of the outwash dam to a height of approximately 650 feet above sea level. The conclusion has already been stated that the valley has never been overflowed by the confined lake waters. It would seem that the waters may easily have filtered thru the sand deposits into the ravines to the west, in the lower part of the old valley. These ravines now contain streams of considerable volume due to the constant seepage of water from the sand at the foot of these steep slopes.

Ashley in his discussion of the stratigraphy of Greene County has the following to say in reference to the Pleistocene:

In the lowlands and prairies the deposits are found to be of considerable depth, often over 100 feet, these places evidently being old valleys filled up. Some interesting deposits occur along the glacial border in eastern Greene County. As the ice pushed its way southeast across the country it overran the lower course of many of the streams flowing west into White River, thus effectively damming them up. Small lakes were thus formed. In time these filled up. Then the ice retreated and the streams resumed their old channels. In most cases they immediately began clearing this lake-deposited material out. As this was in the upper part of their courses where the current had some power, most of the streams have about rid their channels of all vestiges of these deposits. Along Richland Creek in Beech Creek Township, however, much material yet remains in the form of gravel terraces mantling the bluffs of the banks of the streams. In places these terraces are over one-quarter of a mile broad. In the case of a branch of Clifty Creek in the southeastern part of Center Township, instead of clearing out the deposit layed down in the ice-bound lake, the water finds its way down through the mass at several places and flows away underground to appear in the old channel farther down. In this case it would appear quite possible that the water found a passage under the ice before the glacier retreated. The result is a flat filling in a valley to which the name of "American Bottoms" has been given.¹³

Leverett, following Siebenthal's notes, has the following to say about the "American Bottoms":

About four miles south from the point where Richland Creek turned westward into the glaciated district, the glacial boundary comes to the west end of another glacial lake whose site is now known as the "American Bottom". It extends eastward about five miles from the glacial boundary and has an average width of nearly one mile. This old lake bottom now has subterranean drainage through sand deposits to a tribu-

¹³ 23rd Annual Report of the Department of Geology and Natural Resources of Indiana, 1898. Pp. 768-69.

tary of Clifty Creek, where it appears in the form of springs. Because of subterranean drainage the plain is preserved in nearly the condition left by the lake.¹¹

From the above it seems quite evident that both Siebenthal and Ashley thought the water capable of filtering thru the coarse outwash sands and entering the headward-cutting streams below. Such is not the case at present. Bridge Creek and its smaller replicas, as already explained, enter into openings in the massive sandstone bluffs at the south side of the valley. These openings in the sandstone bluffs are very picturesque, and are in themselves remarkable phenomena (see Figs. 5, 6, and 7). It would appear that the water in the former lake of the "American Bottoms" filtered thru the sand, or else entered the already considerably enlarged joints in the Beech Creek limestone, which was well up the side of the pre-glacial valley, and under pressure found its way along the magnificent system of joints. It would not appear that there was much opportunity for the discharge of water thru the present subterranean passages for a considerable time following the withdrawal of the ice from the region. The water at present enters the openings at an elevation of 620 feet, or slightly lower, and emerges as two or three springs in the sandstone wall at the present valley level at the northeast quarter of section 34, at an elevation of 560 feet above sea level, and at a point slightly less than 2 miles southwest measured from the Bridge Creek inlet. While this is an easy line of discharge at present, it is difficult to believe that it was a line of discharge immediately following the ice withdrawal. The waters could have filtered thru the sands after having passed thru the limestone passages; but it is more probable that they filtered thru the sands all along the western barrier, with sufficient volume to prevent the overtopping of the sand barrier. Certainly, if the waters traversed the limestone passages at all immediately following the ice withdrawal, they went thru very slowly, as these passages must have undergone most of their enlargement subsequent to the ice period. Moreover, the valley into which the present outlets debouched was a filled valley, and has only in recent times been excavated to the level where the present springs emerge.

¹¹ F. Leverett, *The Illinois Glacial Lobe. Monograph XXXVIII, United States Geological Survey*, 1898-99. P. 103.



FIG. 5. Bridge Creek entrance into the Cypress sandstone bluff in the northwest corner of section 25. Photograph by P. B. Stockdale.

The present "American Bottoms" area consists of a flat, silty soil, everywhere wet and well leached of its lime content. For the most part it is still the bottom of the former



FIG. 6. Near view of cave-inlet of Bridge Creek. The Beech Creek limestone is 10 feet below the entrance level of the water. Note the massive Cypress sandstone. Photograph by P. B. Stockdale.

shallow lake, the lake having been filled by the material carried in from the surrounding hills. The lake flat slopes west-

ward at a very slight angle from the east to the two main openings. The slope toward these openings from the west is somewhat greater, but is still at a low angle. The latter slope is the surface of the outwash plain which consists mostly of sand. The most fertile land of the region is in this sandy eastward slope. The present stream of Bridge Creek has a poorly marked valley some 12 feet below the general level of the lake flat where the stream flows into the opening in the sandstone bluff. The second largest opening, a quarter of a mile to the west, is entered by a stream flowing in a slightly depressed swail (see Fig. 7). The two small open-



FIG. 7. Cave-inlet of the stream one-fourth mile west of where the Bridge Creek waters become subterranean.

ings in the southern half of the southeast quarter of section 26 have independent streams both of which are depressed more sharply below the general level of the lake flat (see the topographic map). In the northeast quarter of section 26 are several small sinks which have their surface expression in the joints of the massive Cypress sandstone. There are several similar sinks in section 24. Some of these are of more than passing interest on account of being on the "nose" of Cypress sandstone in the southeast quarter of the section. Several small ones here reach down some 40 feet, thru the whole thickness of the Cypress sandstone before coming to the Beech Creek limestone. These sinks show the

results of the passage of water thru the joints in the sandstone to the limestone below, which has been partially removed by solution. These sinks are, of course, due to the Beech Creek limestone below, but superficially they give the appearance of being sinks in the sandstone itself, a thing scarcely possible.

It will be noted by reference to the maps that the entrance to all the inlets into the subterranean passageways lie against the sandstone bluffs at the south side of the valley in a belt running in a general southwesterly direction. A broad, shal-



FIG. 8. Main outlet of Bridge Creek waters from beneath the Cypress sandstone, nearly 2 miles southwest of where the waters enter the subterranean passage ways. The Beech Creek limestone is here some 10 feet below the surface. Photograph by P. B. Stockdale.

low sink-hole is the last of the series. In line with this belt and two miles to the southwest are the outlets to these passageways in the Cypress sandstone bluff on the east side of the re-excavating valley from the north. The chief one of these outlets is the middle one, where most of the normal flow comes out in a broad, ill-defined opening from under the sandstone at the very level of the valley floor (see Fig. 8). A much smaller amount of water comes from the outlet at the south, near the road. The opening to the north, nearly one-quarter of a mile north of the road, is the most interesting (Fig. 9). It is an opening some $2\frac{1}{2}$ feet high and about

10 feet in width, and reaches back under the sandstone to the east. This opening is slightly higher than the openings to the south, but perhaps less than 5 feet higher. The flood water comes out of this opening with great velocity. The opening has a perimeter composed entirely of sandstone, a rather interesting occurrence, showing that it must have been developed along a combined joint and bedding plane, and under pressure from the water within. It is not known how far back one would be able to crawl into the opening, but it is likely that one would come to the passageway, or a series of passageways, along the joints of the Beech Creek lime-

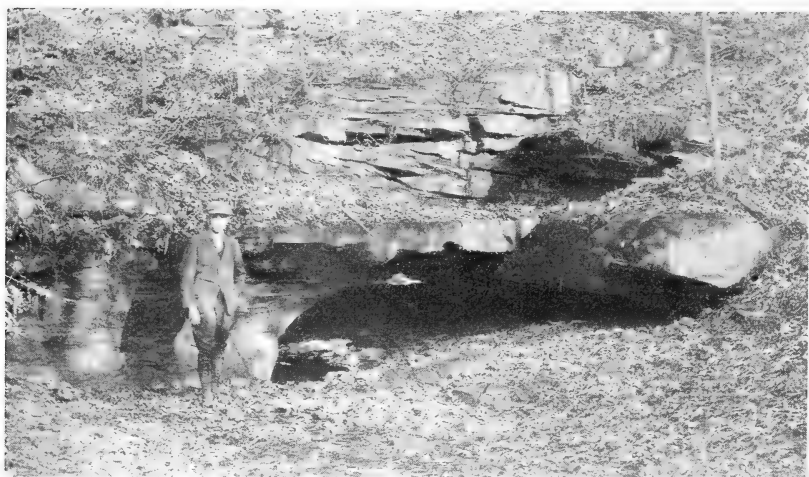


FIG. 9. The flood-water outlet of the water from the "American Bottoms" basin. This opening has its perimeter entirely in the Cypress sandstone.

stone within a few yards or a few hundred feet of the opening, after a descent of not more than 10 or 12 feet.

As indicated by the topographic map, the "American Bottoms" for the most part is a basin, and furthermore a basin with holes in it thru which the water escapes. The 675-foot contour line is the highest depression contour, and encloses approximately 1,475 acres, or $2 \frac{5}{16}$ square miles. The area enclosed by this contour line has a total perimeter of approximately 18 miles. The lake waters were probably much nearer the 650-foot contour line. It may be noted here that some beautiful beach lines are preserved at an elevation of about

645 feet above the road leading east from the church, in the northwest portion of section 34. These gravel beach lines have no relation to the water level of the "American Bottoms" lake. No beaches are preserved in the "American Bottoms" basin. The 625-foot contour line is the third depression contour in the basin, but it is restricted to small areas near where the streams enter the openings. The total depth of the basin from the lowest point in the rims to the hole where the water escapes from the basin is about 65 feet. Some further figures reveal interesting features. Bridge



FIG. 10. Small recent valley leading up the pre-glacial "American Bottoms" valley north of the road at the west side of section 26. The glacial outwash sand is being rapidly removed here. Photograph by P. B. Stockdale.

Creek drains approximately 3,900 acres or about 6 square miles. The water enters the largest inlet cave near the northwest corner of section 25. Sink-inlet number 2, about one-fourth a mile to the west, receives the drainage waters from approximately 1,100 acres. Sink-inlet number 3 or the east one in the southeast portion of the southeast quarter of section 26, receives the drainage waters from about 170 acres. The smallest sink-inlet, number 4, just to the west of number 3, receives the drainage waters from about 60 acres. The sink south of the road in the southern half of section 26 receives the drainage waters from approximately 60 acres.

Thus, a total of approximately 5,200 acres or 8 square miles drains into the holes in the "American Bottoms".

It may be noted that the ravines which are re-excavating the pre-glacial valley to the west and southwest of the old lake basin are taking away the material at a very rapid rate. The ravine in the southwest portion of the northwest quarter of section 26 is a great gully or series of gullies, near its abrupt head, eating directly back up the line of the pre-glacial valley. It would appear that this ravine, which at present is so rapidly reaching into the outwash sand by headward erosion, may in time tap the streams leading into the subterranean openings, and thus divert the drainage approximately thru the old channel to the present Clifty Creek (Fig. 10). While this is a suggestive possibility, it will probably never happen. The present streams of the basin at their subterranean inlets are approximately at an elevation of 620 feet, while the elevation of the ravine where it crosses the road considerably more than a mile to the southwest is only 20 feet lower. This difference is not enough to give the advantage necessary for piracy, since the small stream would probably require much more than 20 feet fall in the distance it would have to go. It would appear that the subterranean passages must persist, unless they should become thoroly choked, which is unlikely.

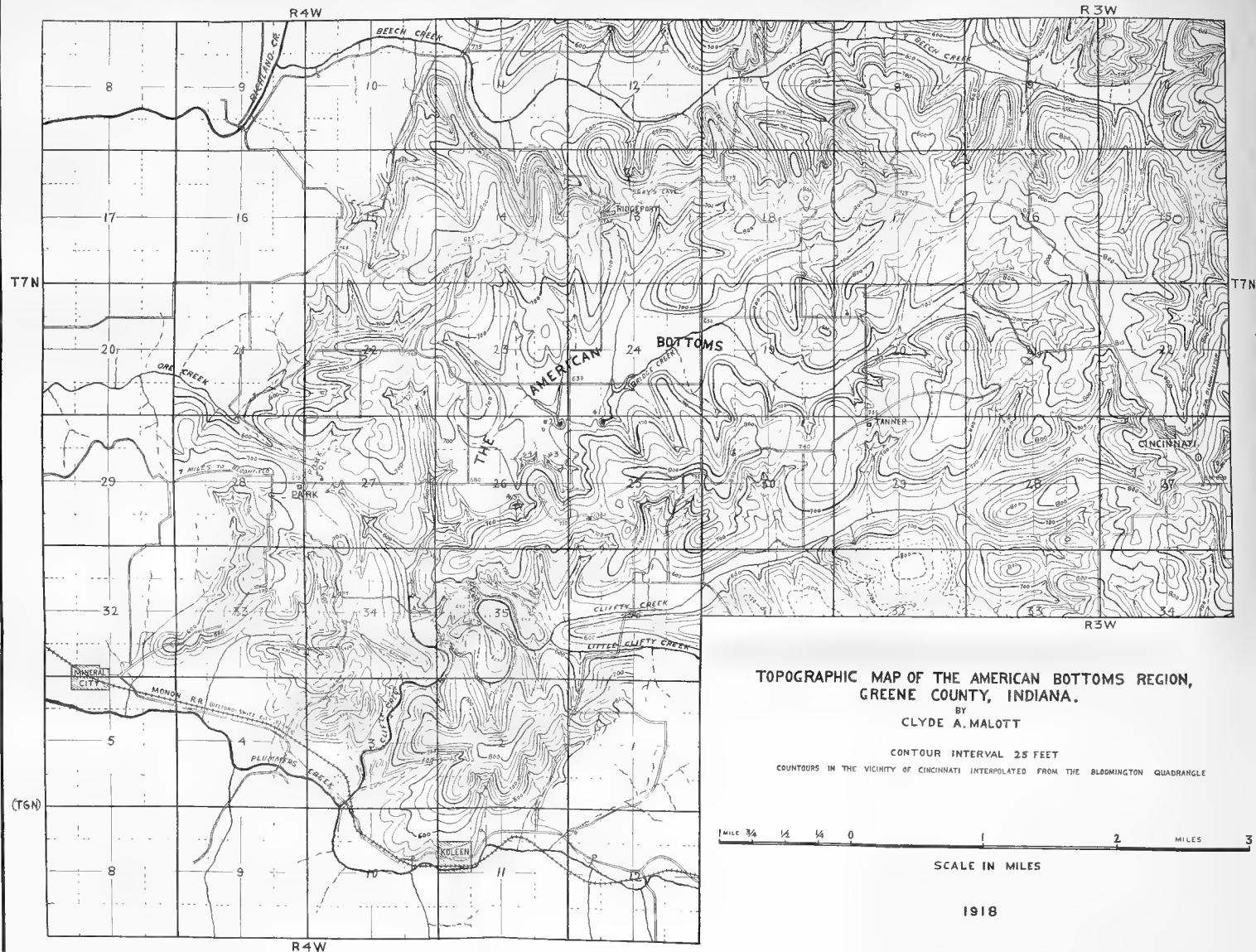
When the inlet-sinks of the "American Bottoms" basin were first examined it was thought that the Beech Creek limestone would certainly be visible, and the fact that nowhere is there the least vestige of it exposed at the surface at any of the openings gave cause for considerable surprise. These openings can be entered for only a short distance. It was found, however, that the water has to pass over logs, sticks, and other trash that has been lodged in the openings near the entrances, and it was found further that the water descends thru the trash very sharply, and probably within a short distance from the entrances reaches the Beech Creek limestone.

Just why the water that enters the openings has not cut down to the level of the limestone passageways is not altogether clear. Only two suggestions adequate to explain this condition occur to the writer from observations made in the field. At the opening much foreign material is carried in



which continually keeps the throat of the sink in a clogged condition. Thus the water in passing over the logs, trash, and other material densely packed with silt at the entrance has no opportunity to cut down the opening to the level of the limestone passageways below. The second suggestion arises from the nature of the top of the limestone as compared with its deeper portions. The upper few feet of the Beech Creek limestone in the "American Bottoms" region, it will be recalled, consist of coarse yellow limestone, containing considerable sand and clay. This upper portion seems to dissolve much more readily because of these properties (Fig. 2). It may be noted that the subterranean drainage which is developed along Clifty Creek does not begin until the top of the limestone is entirely below the level of the stream. The water on the lower side comes out about the middle of the formation. Everywhere that the yellow upper edges are present, the solution joints are much larger than in the purer limestone below. So far as Clifty Creek is concerned, the yellow upper portion is much more favorable for development of subterranean drainage than the lower portion. Certainly if the middle and lower portions were as favorable, there should be considerable subterranean drainage beneath the high narrow ridge in the constriction southeast of the center of section 35, where the water at present strikes directly against the limestone. The yellow upper portion is apparently not present at this place.

The "American Bottoms" Basin Specially Preserved. The "American Bottoms" basin is one of the very unusual physiographic phenomena of southern Indiana, and perhaps has no parallel anywhere in the Mississippi valley. It presents a series of special conditions all of which are specially adjusted. The position of the "American Bottoms" as a filled valley in front of the Illinois Glacial Lobe is not uncommon, but the case becomes special when one recalls that the valley was filled by a particular outwash apron from the ice sheet to the west. Valleys with the same combination of strata are common enough in the Chester Series of southern Indiana, and several of them are filled valleys; but no other has the filling at just the critical height with respect to the Beech Creek limestone, to favor the development of subterranean drainage. The fact that the impounded water which was



raised to this critical level had a porous barrier which did not permit it to overflow, but rather encouraged it to filter thru in sufficient quantity to take care of the inflow, thus allowing time for the development of subterranean passageways with favorable outlets, is another very special factor entering into the problem. For, had this basin been able to overflow at the lower side, it is quite probable that the surface drainage would have persisted, and the "American Bottoms" basin would not have been preserved. Thus, the "American Bottoms" basin is an unusual physiographic feature, because of the exceptional set of conditions critically adjusted to one another. Only by understanding these conditions can we appreciate how and why the "American Bottoms" has been preserved as a youthful area topographically, which must remain for a long time almost exactly as it is today, standing scores of feet above the neighboring valleys.

The "American Bottoms" basin, while probably without parallel, is not such a specific feature that it fails of being a representative of a certain general class. It is a very striking and peculiar feature, but there are others of its type, tho none have gone so far or are so specifically adjusted. To a considerable degree it is a representative of all specially filled valleys in front of the Illinois Glacial Lobe, and perhaps has its closest relative in the "Flatwoods" region of southeastern Owen and western Monroe counties. It has been shown that "Flatwoods" is also a filled valley, and that the filling was not without certain adjustments, and further that McCormicks Creek Canyon, now set aside as one of the state parks because of its exceptional scenic beauty, was probably begun by subterranean drainage, not altogether unlike that of the present "American Bottoms."¹⁵

SUMMARY

This paper postulates that the physiography of southern Indiana has resulted from four conditions or sets of conditions which control the physiographic reactions and topographic forms. Probably the most important of these is the geology. Because of the monoclinical dip to the west, a series of lithological units is presented to the surface, upon which

¹⁵ C. A. Malott, The Flatwoods Region of Owen and Monroe Counties, Indiana. *Proceedings of the Indiana Academy of Science* for 1914.

the physiographic agencies have imprinted their forms. The material on which the processes react is of prime importance in giving rise to topographic forms. A knowledge of the geology of a region goes far in explaining the type of topography present. The second set of conditioning factors consists of the broad crustal movements which have decidedly changed the stream regimen, and consequently have caused certain physiographic forms of more or less wide distribution. The third conditioning factor is glaciation, of such a sort that a triangular area in the middle western portion of southern Indiana has been left unglaciated. The fourth factor is the drainage to the west and south. This factor is related to all the others, but bears a specific and peculiar relation to the glaciation. The latter combination has given rise to very peculiar physiographic relationships and topographic forms. The particulars of these conditioning factors need not be repeated in this summary.

The "American Bottoms" region of eastern Greene County is used as a type unit in southern Indiana physiography. This region is mainly located within the unglaciated area, but laps over into the glaciated portion to the west. Its drainage arises in the unglaciated part and flows toward and into the region formerly covered by the ice. The topography of the region is representative of the rougher and more dissected part of the state, having an immediate relief of some 250 feet. The drainage is peculiar, in that a broad, flat basin known as the "American Bottoms" has a subterranean drainage of a very unusual character.

The rocks of the "American Bottoms" region consist chiefly of several stratigraphic units of the Chester Series of the upper Mississippian. The ridges of the region are capped by the Mansfield sandstone of the Lower Pennsylvanian. The stratigraphic series contain several lithologic types which give rise to certain regional forms inherent in the particular lithologic type. The Beech Creek limestone, the Cypress sandstone, and the Mansfield sandstone are of high importance in controlling topographic forms. The Beech Creek limestone is especially important, not only for the topographic forms it gives rise to, but because it becomes a controlling physiographic factor. The peculiar underground drainage of the "American Bottoms" basin is thru the limestone.

The pre-glacial physiographic history of southern Indiana is concerned mainly with the development of the old Kirksville peneplain and the partial erosion cycles that follow it, one of which was of sufficient duration to develop local peneplains below the older one. The "American Bottoms" region does not have developed in it any recognizable gradation planes or local peneplains below the Kirksville plain, and in so far fails of being a type unit. Stream trenching proceeded below the present valley level of the main streams. This is shown in the "American Bottoms" region. Succeeding the stream trenching there was a period of valley filling. The ordinary interpretation of this valley filling is that it is due to regional depression. An alternative view is given in this paper, in which the valley filling is ascribed to delta building of the master stream, the Mississippi, extending the stream southward into the Gulf Embayment. This delta building took place during the Pleistocene, and preceded the Illinois glacial invasion into the Indiana region.

The coming of the Illinois Glacial Lobe into the southern Indiana region, overriding the west fork of White River and going beyond up the minor drainage basins, thus blocking them either temporarily or permanently, was another important factor in southern Indiana physiography. Streams all along the western margin of the ice sheet were frequently deranged to such an extent that they never recovered, and sought new courses. Practically all streams show the effect of blocking. The "American Bottoms" region illustrates streams that were blocked by the glacial ice, but recovered from it almost entirely, showing now only the effects of having been filled some 30 to 50 feet in their lower courses, on account of the valley train in the west fork of White River. Beech and Plummers creeks are of this type. The lower part of Clifty Creek valley was completely filled by an outwash apron, as was likewise the case in the lower part of the pre-glacial "American Bottoms" valley. These valleys were laked, but Clifty Creek soon sought a new outlet to the southwest. The "American Bottoms" lake never overtopped the outwash barrier at the lower end of its valley.

Following the Illinois glacial epoch, Beech and Plummers creeks gradually removed most of the silt which had accumulated in their valleys. They were able to do this because





the west fork of White River lowered its valley train. While doing it they were always at temporary base level, as they are today. The outwash sands in the lower parts of pre-glacial Clifty Creek and the pre-glacial "American Bottoms" valleys is being deeply trenched by post-glacial streams. Clifty Creek in its initial flow over its adjusted course possessed some rather extraordinary meanders. It has preserved these meanders, entrenching them in both sand and bed rock, depending upon whether it flowed over a pre-glacial valley or over the pre-glacial upland. In its new course it is everywhere gorge-like. At one place it is now making a rather remarkable adjustment to the Beech Creek limestone, where it strikes it at a critical level, and is seeking a subterranean course.

The rim of the "American Bottoms" basin was never overflowed by the impounded waters, for the reason that the sandy barrier to the west permitted the waters to filter thru sufficiently to keep them much below the lowest part of the barrier. Later, subterranean drainage developed in the Beech Creek limestone. This is a remarkable feature. The streams of the basin flow into openings in the Cypress sandstone bluffs at the south side of the valley. Their waters come out from beneath the same sandstone nearly 2 miles to the southwest. This drainage is thru the Beech Creek limestone which is but little more than 20 feet thick.

The "American Bottoms" basin persists in its flat condition of topographic youth, because of the unusual conditions which gave rise to it, and because of the critical adjustments of the drainage. As a physiographical phenomenon it is one of the most peculiar in the Mississippi valley region.

INDIANA UNIVERSITY STUDIES



Study No. 41

A STUDY OF HANDICAPPED CHILDREN: BASED ON
ONE HUNDRED AND FIFTY CRIPPLED CHILDREN
REFERRED TO THE SOCIAL SERVICE DEPART-
MENT OF INDIANA UNIVERSITY. By HELEN HARE,
A.M.

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*Submitted in partial fulfilment of the requirements for the degree of
Master of Arts in Indiana University.*

Foreword

THIS thesis has been prepared under the direction of Dr. Edna G. Henry in partial fulfilment for the degree of Master of Arts in the Social Service Department of Indiana University.

This opportunity is taken to express appreciation to Dr. John H. Oliver, Dr. Edna G. Henry, Miss M. Catherine Murray, the medical and surgical staff of the Robert W. Long Hospital for their generous and valuable assistance.

HELEN HARE.

Indiana University, June, 1919.

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A Study of Handicapped Children

By HELEN HARE, A.M., Hospital Worker in Robert W. Long
Hospital, Indianapolis

INTRODUCTION

MOST of the modern social problems studied and puzzled over by the present-day sociologist have an historical background, and it is interesting to observe the evolution of public attitude toward them with the development of civilization.

Cripples—both children and adults—have been a social problem, or at least a social recognition, from the beginning of history. The superstition of mediaeval times lent a tinge of awe and fear to any human being varying from the normal type. The cripples, like the insane, were regarded as freaks of witchcraft, and were shunned accordingly. The poor creatures were discriminated against as if they had been to blame for their own tragic disability. The earliest record of any definite recognition of the problem of cripples dates back to 590 A.D. when Pope Gregory reformed the Church and charity administration in Rome, and included the cripples with all the other infirm and destitute, who as a class were to be supported by public funds.¹ Thus pauperism was considered a special privileged state for cripples, and their salvation was farther from their reach than ever! The church was the original institutional basis for “poor” and “sick relief”, and tho the mistake of pauperizing was practiced, yet the church deserves credit for making the first effort to alleviate the situation. At this same time the cripple was being exploited for the amusement of the idle pleasure-seekers, and we have historical tales of the dwarfed and hunchbacked court jesters and fools. The more grotesquely misshapen the cripple, the more popular and valuable he was for catering to the cruel enjoyment of the courtiers. Verdi’s opera “Rigoletto” illustrates the tragic appeal of the court jester, as does also a little play called *The Birthday of the Infanta*, in which

¹ *The Modern Hospital*, March, 1919, pp. 164-168.

the poor crippled "grotesque" dies of grief when he beholds his misshapen figure in a mirror. This exploitation of cripples for entertainment did not equal in horror the Roman and Italian custom of commercializing the crippled children beggars. Powerful Roman "masters" made slaves of these poor waifs and forced them to exhibit their deformities in conspicuous public places in order to arouse the sympathetic emotions of passers-by and thus obtain money. In many cases children were purposely maimed so that they could be used as a source of income either by their masters or families. Such cruelty seems inconceivable and surely it was a hideous way for people to make money.

In the early part of the sixteenth century, an organization of poor relief was formed outside the Church, in connection with the hospitals, and in 1601 came the really pioneer Poor Relief Act of Queen Elizabeth. Tho the cripples were included with the "infirm" and "sick" in this system of care of the poor, asylum care was the only provision made. With the beginning of the science of orthopedics in the nineteenth century, the care of cripples was put on a different and more optimistic basis, and since then rapid strides have been made in improving and often curing the deformity of the crippled individual.

There are many fundamental reasons why the care of cripples should be a field of social interest and investigation and improvement. The enormous economic saving to communities where all the cripples could be given surgical care is in itself argument enough for public support. The value of increased morale which would be secured thru the transformation of many beggars into self-respecting wage-earners is another argument.

But perhaps the greatest argument for the care of cripples is the obvious social justice of giving every child an equal chance in life. The percentage of crippled children who can be cured or improved is so far higher than the percentage of the incurable that it is criminal for any deformed youngster to be deprived of the opportunity of medical examination and subsequent treatment. It is obviously a social duty and public obligation to provide proper and adequate care for the crippled children who are unable to pay for private medical attention.

I. SOURCE OF MATERIAL

A Study of Handicapped Children is a title needing specific definition, as the word "handicapped" embraces a wide field of deficiency, whereas this study is limited to the one group of "crippled" children. This term "crippled" excludes the blind and the deaf, and includes only orthopedic deformities. The 150 cases of crippled children which are surveyed in this study were obtained from the records of the Social Service Department of Indiana University. These cases were with few exceptions given medical or surgical treatment in the free clinics of the Indianapolis City Dispensary and the Robert W. Long Hospital, and were referred to the Social Service Department for investigation of the social factors involved. The cripples included here are limited to those under eighteen years of age, the average age proving to be eight years. There are 76 girls and 74 boys among the total 150; and of these there are 7 cases of negroes. As the Social Service Department has two fields for its work—the State Hospital and the City Dispensary—these cases include representatives from both sources.

The hospital cases here cited include all the cases referred to the Social Service Department of crippled children under eighteen years of age admitted to the Robert W. Long Hospital from the opening of the hospital in 1914 till March 1, 1919,—a total sum of 128 cases. There is constantly an enormous waiting list of applicants for admission to the hospital, but since the crippled cases are seldom emergency cases, they are frequently kept waiting for cases demanding immediate attention. As the hospital is a state institution, only a limited number of city cases are admitted unless offering an unusual or instructive clinic for the medical students. More frequently in Indianapolis they are sent to the City Hospital. State cases are admitted more easily and in greater numbers, and the Long Hospital has attained a popular reputation thru the state of Indiana from the number of cripples who have been cured or helped there, and who have returned home to spread the tale of their marvelous care among their respective localities! There is one drawback to the efficiency of the care given these state cases: in a general hospital it is impossible to keep the patients (except in rare cases) for

the full length of time necessary to complete an orthopedic correction. The convalescent cases are crowded out by emergency cases needing the beds, and a child once released from the hospital is difficult to bring in again for the frequent examinations and careful observation of developments that are necessary. To secure the return of one of these out-of-town cases requires correspondence with either parents or local social agency or both; and in many cases necessitates a visit by the state worker of the department. The state worker is a valuable asset for this particular work, and also for "follow up" work—ascertaining the subsequent condition of patients after leaving the hospitals and lining up the home situation.

The greater per cent of the children in the Long Hospital come from out of town; of these 150 cases 98 or 65 per cent are state cases. As the after-care of these orthopedic cases is of such vast importance, the state cases are obviously the biggest problem the department has to deal with among its crippled children.

The dispensary cases here included are those referred to the Social Service Department for following from one of the various clinics: pediatrics, general medicine, or orthopedic. The orthopedic clinic is held once a week, and here the cases previously diagnosed as orthopedic in one of the general clinics are examined by the attending surgeon. A diagnosis of the kind of crippled condition presented is made and orders for subsequent surgical care are prescribed. At this point the Social Service Department dips its finger in the pie and lends its invaluable assistance, for there is "many a slip 'twixt" the examination in the dispensary clinic and the advised surgical correction in the hospital! The word "hospital" inspires fear in the minds of most normal children, and no less in the minds of ignorant parents. The first usual reflex to the doctor's advice of surgical care is a positive refusal to comply on the part of patient and family. A doctor's time is too valuable for him to argue and plead with each individual, so that it becomes the job of the social service worker to talk to the patient's family and point out the advantages and advisability of hospital care.

CASE H. G. 6,900. In the case of a small nine-year-old boy, H. G., who was brought into the dispensary for examina-

tion in the orthopedic clinic, there resulted a good deal of excitement. The doctor pronounced the boy's case a congenital double clubfoot, and ordered immediate transference of the patient to the hospital for surgical correction. A storm of tears and sobs from both the child and his mother followed the doctor's verdict. The mother vehemently announced her refusal and said she would rather have a deformed child than run the risk of losing him by an operation. The doctor pointed out to the mother that it was selfish of her to stand in the way of the child's chance to become a normal happy boy; and when the mother still refused to be convinced, the doctor grew impatient—as what man would not?—and dismissed the patient as out of his power of jurisdiction, tho he said he would report it to the court as a case of criminal neglect. By dint of long argument and reasoning the social service worker was finally able to persuade the family that it was an actual cruelty to the child not to give him the surgical care he needed. Usually in a family situation like this, one of the parents can be approached even if the other one is obdurate. In this case of H. G. the father proved sensible, arrangements were made quickly so that there might not be too much time for hesitation, and before nightfall on the same day the boy was installed in the hospital.

Not every case offers as many complications as the above-mentioned one. Occasionally a sensible patient comes in who is above the average, and is eager to obtain the right care for himself as soon as possible. In these cases the social service worker forms the link between the dispensary and the hospital,—advising the patient how to make the application for hospital admission, making investigations of home conditions, and in general sizing up the social aspect of the case. When the patient is a cripple, the social background of the case is of great importance—to discover the possible cause of the physical condition of the patient, and the kind of social treatment he has encountered often lends a hint to the solution of the existing problem.

II. CAUSES OF CRIPPLED CONDITIONS: ENUMERATION AND DEFINITIONS¹

DEFORMITIES occurring in children can be traced to four general causes: disease, congenital condition, accident, and incorrect posture. A brief enumeration of the diagnoses arising from these fundamental causes and a definition of each will perhaps be illuminating as a background for the discussion of the social aspect of crippled children.

1. Tuberculosis of Bones and Joints. This disease is responsible for a large percentage of crippled children. It occurs most frequently in children from three to ten years of age—during the time when accidents are most apt to occur, and when rapid growth decreases constitutional resistance against possible infection. The prognosis depends on the inherited constitution of the patient, and the environmental treatment—including rest and nutrition—which he receives. Cases receiving proper treatment and general care soon after the diagnosis is made stand a good chance of recovery. This disease attacks the lower extremities and the spine most frequently.

Tuberculosis of the Spine, or Pott's Disease, is subdivided into dorsal, lumbar, and cervical Pott's Disease. "The etiology or causation in at least one-half the cases is traceable to some slight injury to one or more of the vertebrae."² During the course of the disease abscesses may or may not appear and eventually the typical "hunchback" condition develops "unless the destructive process is promptly checked".² Early treatment by recumbency in a frame, plaster jackets, steel braces, and occasionally surgery gives a fairly favorable prognosis in young subjects.

Tuberculosis of the Hip is located in the head of the femur, and the first sign of its presence is shown by stiffness and lameness, formation of abscesses, and a gradual shortening of the leg. Treatment by fixation, plaster casts, braces, and surgery will result in a probable cure of the tuberculous condition, but will leave the hip more or less stiff for life. Double hip joint disease is included under the diagnosis of tuberculosis of the hip, and is treated in the same way, the chances for recovery being somewhat less.

¹ Bradford and Lovett, *Orthopedic Surgery*.

² Quotation from Dr. John H. Oliver.

Tuberculosis of the Knee is indicated by localized pain, swelling, and abscess. Early treatment by operation, fixation, and braces lead to favorable recovery in the majority of cases, tho there is a tendency to stiffness resulting, and in some virulent cases amputation of the leg becomes necessary.

Tuberculosis of the Ankle, Shoulder, Elbow, and Wrist all show the same general symptoms of swelling, pain, suppuration, and atrophy. The treatment for all four conditions is practically the same, consisting of fixation and protection, plaster casts, and in most cases surgery. Among children the prognosis for all these conditions is favorable if given early treatment after the symptoms of the disease are discovered.

2. Osteomyelitis. This disease usually occurs at or after puberty, often as a result of any infectious and exhausting illness or exposure. It is a bacterial infection of the bone marrow, with the formation of abscesses and a general septic condition resulting. The localized seat of the infection is in the shafts of the long bones. Treatment consists of drainage by incision, and in some cases the removal of the diseased portion of the bone. In severe cases there is danger of septicæmia, but in ordinary cases proper treatment will result in a healing of the diseased parts.

3. Arthritis. This disease commonly known as "rheumatism" is an inflammation of the joints which may be chronic or acute. Symptoms are pain and swelling and often stiffness of the joint results. Acute articular rheumatism of one joint never occurs, and if such symptoms arise, the origin of the inflammation will usually prove to be "tuberculous or some other specific infection".³

Arthritis Deformans is a chronic non-suppurative affection of the joints, commonly called "rheumatic gout", tho more virulent developments than gout sometimes occur. This disease seldom occurs in children, as it generally appears with senile changes such as arterio-sclerosis.

4. Rickets. Rickets is a disease occurring in very young children as a result of faulty nutrition during first dentition. Softening of the bones is the characteristic feature, and muscular action of the child while the bones are in a pliable

³ Quotation from Dr. John H. Oliver.

condition results in deformities of various parts of the body—enlarged ankles and wrists, “rosary” of ribs, pigeon breast, bow legs, knock knees, flat feet, etc. Proper feeding and hygienic care bring favorable results if the patient is treated early in the course of the disease.

5. Scoliosis. Scoliosis is a lateral curvature of the spine, occurring more frequently in girls than boys between the ages of ten and sixteen years. This spinal deformity is caused sometimes by paralysis, by rickets, by faulty “positions of the body increased by the superincumbent weight of the head and body”⁴ in industry and school, or by inequality of the limbs. Treatments for scoliosis are gymnastic exercises in mild cases and corrective plaster or leather jackets for the more advanced cases. Scoliosis in the majority of cases is a preventable condition. If children are watched closely, with the first sign of a spinal curvature corrective exercises can be given to prevent faulty positions in standing and sitting and the development of deformity.

6. Kyphosis. Kyphosis is the typical “hunchback” condition—a backward curvature or knuckling of the spine, usually following Pott’s Disease. Round shoulders are common and are best treated by gymnastics and the avoidance of heavy clothing hanging from the shoulders. Shoulder braces are to be avoided.

7. Poliomyelitis. Anterior poliomyelitis, poliomyelo encephalitis, both are synonymous with the more commonly known term—infantile paralysis, which is responsible for such a large per cent of deformity among children. This is an acute contagious infection, most prevalent in summer, which attacks children almost exclusively. There are three stages to the disease: (1) febrile symptoms and development of paralysis; (2) full development of paralysis and a stationary period; (3) atrophy of muscles and wasting of limbs followed by about a six months’ period of gradual slight improvement. During the acute stage of the disease the patient’s general condition should be stimulated to further resistance, and the weak muscles should be protected from sustaining weight, in order to prevent development of deformities as far as possible. Deformities result from bone shortening in some cases, but more

⁴ Quotation from Dr. John H. Oliver.

frequently from muscular paralysis which causes: (1) complete paralysis of the leg with wasted bones and distorted joints; (2) partial paralysis of the leg with the inability to support the weight of the body; and (3) dislocations with muscular contraction. The treatment of these cases should be absolute rest in bed until all acute symptoms have subsided. Later treatment for infantile paralysis consists in stimulation of the motor tract by massage, electricity, application of heat, etc., so that the muscle may be able to respond when the nerve impulse is restored. In some cases surgery is used in the transference of muscles and tendons, or the stiffening of the joint. Plaster bandages and braces are also employed for corrective and strengthening purposes. Remarkable corrective results have been attained in cases where the paralyzed condition was not too extensive to permit of improvement. Infantile paralysis is both an endemic and epidemic disease. "Endemic cases we have with us always, but epidemics occur only occasionally, a notable one having occurred in the summer of 1916 in the United States."⁵

The eastern states suffered much more severely than the West and Middle West. The Indiana State Board of Health statistics for the summer of 1916 show that the ravages of the disease were not as devastating in Indiana as in the East:

MONTHS	CASES	DEATHS
June	1	0
July	25	5
August	39	6
September	64	14
October	57	9

8. Spastic Paralysis. Spastic paralysis is either congenital or acquired. Congenital cases are due to intra-uterine hemorrhage which causes retardation of the growth of the brain plus secondary changes in the spine. Such cases are rare. Acquired spastic paralysis is due to a cerebral lesion or "affects children whose birth was assisted by forceps". Spasm of the muscles, mental deficiency, and convulsions are characteristic. "When both legs and both arms, or both arms are paralyzed, the disease is called 'diplegia'; when both legs alone, 'paraplegia'; when the arm and the leg on the same side, 'hemiplegia'; and when one member of the

⁵ Quotation from Dr. John H. Oliver.

body only, 'monoplegia'."⁶ The treatment for spastic paralysis is similar to that for spinal paralysis, only the prognosis is in most cases unfavorable, particularly where epilepsy and mental derangement accompany the paralysis. This is the one crippled condition where mental deficiency is a relative factor. "There are other conditions in which we may have both the mind impaired or destroyed together with paralysis, such as Hydrocephalus and Microcephalus; but these are not classified as paralyzes per se."⁷

CASE E. W. 2,117. This is a case of an illegitimate child, paralyzed in both legs, and feeble-minded—a typical spastic paraplegia. He is unable physically and mentally to go to school. His mother has married and her husband is unwilling to support another man's child, so the boy has been entered on the waiting list of the State School for Feeble-Minded, where he will probably remain indefinitely.

9. Congenital Dislocation of the Hip. This condition is found more often in girls than in boys. It is a marked deformity and hinders walking. Treatment by manipulative reduction followed by plaster casts results in gratifying correction in many cases.

10. Clubfoot. The commonest form of clubfoot is *talipes equino-varus*, where there is an elevation of the heel and inversion of the sole inward, with pressure on the outer edge of the foot. In these cases the varus condition is congenital; and the equinus is usually acquired when the patient first begins to walk. The cause of the congenital condition is a perversion of intra-uterine development or abnormal intra-uterine pressure. Treatment of the deformity consists in surgical correction first of the varus condition, and then of the equinus. Forced manipulation, sub-cutaneous division of ligaments (tenotomy), plaster splints, and braces all form the various steps in this treatment, and provided that the patient follows the treatment prescribed during the long convalescent period, favorable results are attained. There are several other forms of clubfoot besides *talipes equino-varus*. *Talipes equinus* or "horse heel" is a form acquired after infantile paralysis, or from the shortening of a leg after a joint disease such as tuberculosis of the hip. *Talipes calcaneus* is

⁶ Emerson, *Essentials of Medicine*, p. 200.

⁷ Quotation from Dr. John H. Oliver.

characterized by the patient's walking on the heel. *Talipes valgus* is a deformity where the patient walks on the inward edge of the sole, and it is contrasted with *talipes varus* where the patient walks on the outer edge of the sole. *Talipes cavus* or "hollow foot" is a condition where the arch is overdeveloped. And lastly the *non-deforming clubfoot* is a condition where there is loss of the dorsal flexion of the foot.

CASE H. E. 2,161. This case is an illustration of congenital clubfoot—a little boy, five years old, who was brought into the hospital and received surgical correction, and afterwards braces. Two other cases of clubfoot in the family—the patient's brother and the father's cousin—seem to indicate that such a congenital condition is apt to occur in the same family, tho there is no plausible explanation for it. In this particular case there is a tragedy connected with the story. Eventually the patient's little brother was brought into the hospital and had his feet corrected, and both children were sent home in splendid convalescent condition. A year or so later, a letter was received from the father of the children saying the older boy while playing with a gun had accidentally shot and killed the younger brother. The parents were heart-broken, as they had been so delighted with the improvement in the children's feet.

11. Flat foot. Flat foot is a condition where the arch of the foot is broken down and the sole becomes flattened. Exercises and braces are used in corrective treatment.

12. Harelip.^s Harelip is due to prenatal arrested development, and may be single or double. Surgical correction when the patient is about two months old results favorably in most cases, leaving only a slight scar.

13. Cleft Palate.^o Cleft palate is closely related to harelip condition and both often occur simultaneously. Cleft palate is also due to arrested embryonic development—"a deficiency in the median line of the roof of the mouth". Here again surgical correction is recommended during the second or third month after birth, tho cases are treated in older children. A neglected cleft palate affects speech very noticeably and is a marked handicap. Both cleft palates and harelips are often found occurring in different members of the

^s McMurrich, *The Development of the Human Body*, p. 100.

^o *Ibid.*, p. 284

same family; and tho there has not as yet been discovered a definite cause for this malformation, yet it has been noticed that cases are apt to occur in families where physical degeneracy is an outstanding characteristic.

14. Lordosis. Lordosis is a condition of round hollow back.

15. Torticollis. Torticollis, more popularly known as "wry neck", is either a congenital condition or acquired from contraction of the sterno-mastoid muscle. Surgical treatment and braces are both used for correction.

In summing up the causes of deformity in children, disease is responsible for more than half. Taking statistics from two different localities, this statement is proved true. At the Massachusetts Hospital School for the care of Crippled Children, during the year 1917, "77 per cent of the cases received were suffering from the effects of surgical tuberculosis and infantile paralysis".¹⁰ "In Cleveland, the survey of cripples in 1915-1916 showed that out of 936 cases of crippled children under fifteen years of age, 72 per cent were cases suffering from the effects of diseases."¹¹ Likewise the statistics deduced from this survey of 150 crippled children prove the same results, as 54 per cent of the cases have definite diagnoses attributing the cause of deformity to disease, while many others in addition were doubtless due to disease in the original form of the disability. The following table gives the classification of the 150 cases here studied into the 14 different diagnoses of various conditions:

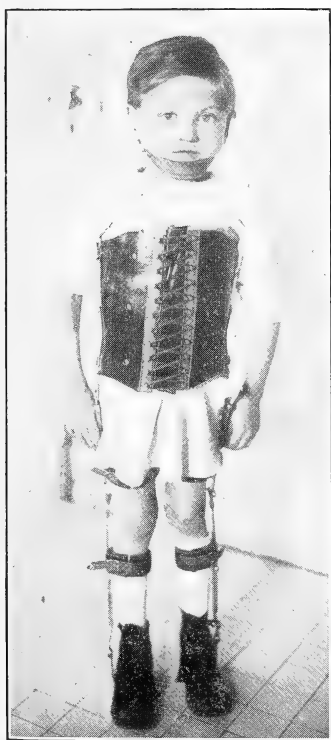
		PER CENT
1. Tuberculous diseases	43	28.66
A. Tuberculosis of hip.....	23	15.33
B. Tuberculosis of spine.....	10	6.66
C. Tuberculosis of knee.....	5	3.33
D. Double hip joint disease.....	3	2.00
E. Tuberculosis of elbow.....	1	.66
F. Tuberculosis of foot.....	1	.66
2. Clubfeet	26	17.33
3. Infantile paralysis	18	12
4. Scoliosis	11	7
5. Osteomyelitis	11	7
6. Cleft palate	7 }	8
A. Cleft palate and harelip.....	5 }	

¹⁰ Massachusetts Hospital School, Report of 1917, p. 20.

¹¹ Cleveland Survey—Education and Occupation of Cripples—Juvenile and Adult, 1917, p. 38.

		PER CENT
7. Harelip	6	4
8. Kyphosis	2	1.33
9. Arthritis	3	
A. Arthritis	1	2
B. Chronic arthritis	1	
C. Arthritis deformans	1	
10. Spastic Paralysis	5	
A. Spastic paraplegia	4	3
B. Flaccid paraplegia	1	
11. Congenital deformities	1	.66
12. Injuries	8	5
13. Rickets	3	2
14. Pesplanus	1	.66

Photographs of a few of the patients included in this study are given to illustrate some of the cases of the above-mentioned diseases.



Case J. A. 2,955

ILLUSTRATION I



Case J. A. 2,955

ILLUSTRATION II

CASE J. A. 2,955. This is a case of Pott's Disease in a little five-year-old boy who came into the hospital for treatment three years ago. He was a very sick child when he first came in, and his treatment was a slow process; but gradually his condition improved, and the accompanying picture (Illustration I) shows him in his braces from top to toe, with the long journey of treatment nearing its goal. The other photograph (Illustration II) shows the hump on the back where the tuberculous condition was centered. Recent X-ray slides have shown that the bone condition is improving, and it is believed that the child will recover eventually and finally have a chance to be a normal boy.



Case L. F. 6,528

ILLUSTRATION III A
(Before treatment)



Case L. F. 6,528

ILLUSTRATION III B

CASE L. F. 6,528. This is a case of a little girl with double hip joint disease who inherited a weakened constitution and a tendency toward tuberculosis. She hardly had a fair start in life! Tho the prognosis on her case was unfavorable at first, she gradually improved till at the present time she is wearing braces and hops about on crutches with increasing agility, and eventually she will walk, tho with stiffened hips. The accompanying photograph (Illustration III) shows her just before her discharge from the hospital.



Case R. G. 6,847

ILLUSTRATION IV



Case G. F. 6,393

ILLUSTRATION V

CASE R. G. 6,847. This case is a beautiful little girl with tuberculosis of the hip. The infection in the hip caused a shortening of the leg, but with her shoe built up as is shown in the picture (Illustration IV) and braces and crutches temporarily to keep the weight and strain off the affected leg, she is improving gradually and is able to walk about.

CASE G. F. 6,393. This is a case of tuberculosis of the knee in an attractive little boy, who responded splendidly to treatment, so that now he walks about wearing a brace (Illustration V) and within a short time will be able to take it off.



Case A. R. 5,439

ILLUSTRATION VI

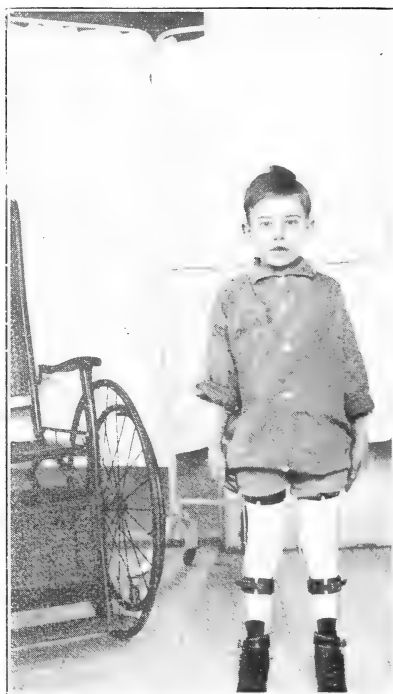
CASE A. R. 5,439. This case is a dear little girl paralyzed in both legs as the result of poliomyelitis. She has not been able to stand upright, so that her method of locomotion is by crawling crab-wise on the floor at home, and by means of a wheeled chair in the hospital (Illustration VI). She has received treatment to encourage stimulation in the paralyzed nerves and muscles, and eventually it is hoped that by means of braces and crutches she will be able to stand upright.

CASE H. G. 6,900. This is a case of double congenital club-foot in a boy of nine years. The child had had an incorrect operation when a baby, so that his condition upon entrance to the hospital was deplorable (Illustration VII). Forced manipulation and plaster splints have so far corrected the deformity that at the end of three months he was ready for braces and discharge from the hospital, with directions to return for examination at stated intervals.



Case H. G. 6,900

ILLUSTRATION VII A
(Before correction)



Case H. G. 6,900

ILLUSTRATION VII B
(After correction)

CASE J. M. 7,008. This case is a dear little boy, afflicted with extraordinary congenital deformities. His hands and arms are pitifully shrunk and atrophied; and his legs show arrested embryonic development, as the legs below the knee joint are turned back (Illustration VIII). The child walked about quite actively on the knee joints, and recently even attended school in spite of his great handicap. Upon examina-

tion of his condition, it was decided to amputate both legs at the knee, so that there might be a foundation for artificial limbs. The operation has been performed and, as soon as is advisable, the boy will be fitted out with artificial legs, and then he can start out life all over again on a level with other boys.

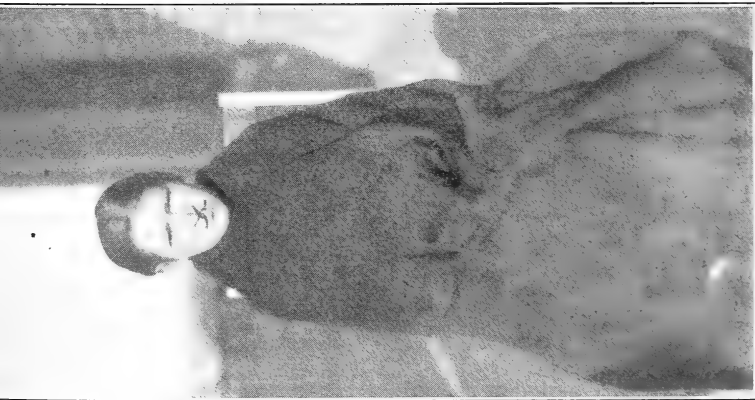


Case J. M. 7,008

ILLUSTRATION VIII

CASE D. L. 4,344. This case is a twelve-year-old girl sent in from one of the State Orphans' Homes for correction of harelip and cleft palate (Illustration IX). She received surgical treatment which improved her prematurely old appearance greatly, but her failure to return as requested has prevented the complete correction of the cleft palate condition. Further attempts will be made to secure her return and treatment.

The treatment given to these 150 cases has been subdivided into separate classes, many of which doubtless would be combined if scientifically cited, but this is a layman's classification.



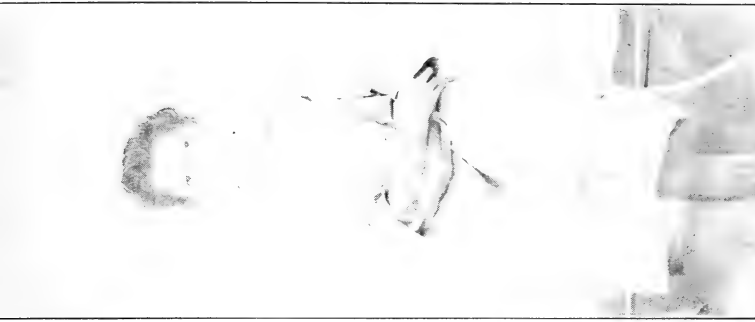
Case D. L. 4,344

ILLUSTRATION IX A
(Before correction)



Case D. L. 4,344

ILLUSTRATION IX B
(Showing cleft palate)



Case D. L. 4,344

ILLUSTRATION IX C
(After correction)

TREATMENT	NUMBER OF CASES
1. Examination only	13
2. Surgical care advised but not given (due to patient's or family's objection)	8
3. Surgical	65
4. Plaster casts	22
5. Braces	45
6. Bradford frame	3
7. Buck's extension	2
8. Leather jacket	2
9. Electrical	1
10. X-ray treatment	3
11. Bismuth injection	2
12. Massage	3

Besides these stated treatments within the hospital, many of the cases received treatment from other sources after leaving the hospital jurisdiction. There is record on 3 of the cases of chiropractic treatments given to the patients. In every case the parents had to pay large bills to the chiropractor, but were hypnotized into faith in his supposedly magic powers of cure! The harm that is done by these unscientific practitioners in a field that should receive the best surgical care is appalling; and from a social angle it is distressing to contemplate the cruelty of extorting money from the ignorant parents who sacrifice actual necessities to pay the bills.

It is interesting to note the results of the treatments given to the cases here included:

RESULT OF TREATMENT	NUMBER OF CASES
1. Cured	12
2. Improved	86
3. Unimproved	17
4. Incurable	6
5. Dead	11

In many of the unimproved cases, the cause can be attributed to neglect on the patient's part in following the doctor's orders, or in returning for regular examination or treatment. This point again illustrates the need of a convalescent hospital where patients can be kept till all possible efforts for cure or improvement have been completed. Also of the 11 cases cited as having died, none of the immediate causes of death were connected with the crippled condition: in 4 cases the cause was generalized tuberculosis; in 1 case, pneumonia;

in 1 case, kidney trouble; in 1 case, heart trouble; in 1 case, accident; in 1 case, complete degeneration; and in 2 cases, acute infections. The number of cases cured or greatly improved by surgical treatment so far outnumber the cases where results have been unsatisfactory that orthopedic surgery has been proved an immeasurable pinnacle in the development of scientific treatment.

In connection with the diagnoses of the cases here studied, it is interesting to note the family history of disease in the various cases, and the hypothetical relation of family health conditions to the deformed condition of the various patients. The data given in the following table are far from exhaustive and complete, since in the cases of children from out of town it was impossible to learn full family history, and again in other cases the ignorance of the patient's family revealed the impossibility of securing authentic information from them. In the following classification "negative" family history is used to include these cases where information was not forthcoming, and also those cases where, as far as could be discovered, there was a clean slate on the family health conditions. See the Table of Family History of Disease.

From this table it can be seen that, on the whole, deformity of children does not reflect directly on family health conditions. Tuberculosis is frequent in the families of children having tuberculous bone and joint infection, which shows that a weakened constitution with a receptive tendency to acquire tuberculosis is inherited, and also that it is a contagious disease. Infantile paralysis, being a contagious infection, naturally does not need family inherited conditions to explain its development. The syphilis is sometimes responsible for cases of congenital deformity, yet it is not as frequent a cause as intra-uterine pressure. Therefore the conclusion can be drawn that with the exception of the tuberculosis conditions, deformity of children cannot be attributed to related family physical conditions.

TABLE OF FAMILY HISTORY OF DISEASE

CASES STUDIED	Negative	*Miscellaneous	Syphilis	Alcoholism	Mental Defective	Spinal Defect	Heart	Tuberculosis	Same condition as patient	Harelip	Paralysis
1. Tuberculosis of bones and joints...	16	3	0	2	2	0	1	19	....	....	....
2. Infantile paralysis...	10	2	1	....	1	1	1	....	....	....	....
3. Clubfeet.....	14	1	1	....	1	1	1	3	3	1	....
4. Scoliosis.....	6	....	1	....	2	....	1	....	....	....	1
5. Kyphosis.....	1	....	....	....	....	....	....	....	....	....	1
6. Osteomyelitis.....	9	....	....	....	....	....	....	2	....	....	....
7. Harelip.....	4	....	....	1	1	....	....	1	1	....	....
8. Cleft palate.....	6	....	....	....	....	....	....	....	....	....	1
9. Arthritis.....	....	....	....	....	1	....	....	....	1	....	1
10. Spastic paralysis.....	5	....	....	....	....	....	....	....	....	....	....
11. Congenital deformity	1	....	....	....	....	....	....	....	....	....	....
12. Rickets.....	1	....	....	....	....	1	1	....	....	....	....
13. Pesplanus.....	1	....	....	....	....	....	....	....	....	....	....
14. Injuries.....	7	....	1	....	....	....	....	....	....	....	....

*Miscellaneous includes discharging ears, degeneracy, deaf mute, cancer, kidney trouble.

III. SOCIAL CONDITIONS

SOCIAL conditions and their relationship—direct or indirect—to the health conditions found present in the patients referred to the Social Service Department is perhaps the most vital field of research and information. Tho it is essential for the medical social service worker to be sufficiently cognizant of the medical condition of the patients in order to deal intelligently with them, yet it is pre-eminently his or her work to emphasize the social conditions—family, community, or institution—which form the background of every individual's life. The two chief benefits, in supplementing the doctor's care, gained by patients from the social service worker are: first, the possible discovery of social conditions as a partial cause of the patient's physical condition; and, second, the improvements in these social surroundings as an asset in aiding the patient's recovery and in avoiding preventable illnesses. By information gathered from the patients themselves and their families when possible, and by home visits for observation in many cases, a few details of the standard of living and general social conditions existing in the homes or dwellings of these 150 cases of crippled children have been summarized as follows:

STANDARD OF LIVING—

1. Cases where family showed intelligence.....	56
2. Cases where family showed ignorance.....	75
3. Cases with average family income (\$2 per day).....	47
4. Cases with poor family income.....	73
5. Cases with neglected home conditions.....	55
6. Cases where coöperation with hospital shown.....	49
7. Cases where antagonism against hospital shown.....	25
8. Cases where immorality in family cited.....	13
9. Cases of foreign parentage.....	12
10. Negro cases	7

This table is only approximate and not statistically exact, as the available information on the subject was only general. But the existing conditions included under standard of living as here classified are interesting as reflecting on the cases which come into the hospital and dispensary. It is perhaps impossible to make a definite distinction between ignorant and intelligent families—the basis for division must vary

naturally; but the classification made here has been based mostly on the related general home conditions and atmosphere—the two general types of homes, where an attempt at cleanliness and care of the children is exhibited, and where conditions are inexcusably neglected and dirty. The classification of average and poor incomes is also a purely approximate division, as in the types of families illustrated by these cases, the incomes are irregular and constantly changing up and down the scale, depending upon conditions of industry and employment in which the father or mother of the family is engaged. An exception to this class of shifting wage-earners is the class of farm laborers, who for the most part do not change their occupation. Of the 12 cases of foreigners included in this group of 150, the standard of living is in almost every case below the average. The children of these foreigners were in most cases referred from the public schools, and the parents remain curiously aloof, with diffidence and shyness. The type of social surroundings which form the background of the crippled children is usually superior in a general way to that of the majority of the dependent sick cases, tho there are exceptions such as one case here cited.

CASE G. W. This case is a twelve-year-old girl who was frightfully burned by a kerosene explosion when she was alone at home. Subsequent hospital care brought slow and discouraging results; the burn had extended down the child's left side from the shoulder to her hip and eventually the entire arm had to be amputated. She remained in the hospital for many months before the wounds had healed sufficiently for her to be discharged, and always she was a pathetic, spiritually-starved looking child. A home visit gave the explanation of her manner: the family is a typical Kentucky "poor white trash" brand, with all the shiftlessness, filth, and ignorance that that term can imply. The house was in shocking disrepair when seen; the bed, a mere heap of filthy coverings; and the children who came to the door were clothed in dirty rags and looked as peaked and neglected as our little patient. Later investigation resulted in the discovery of syphilis in both the mother and father acquired since moving into the city. The case is a typical illustration of neglected home conditions and maladjustment to new surroundings,

Contrary to this flagrant example of poor social conditions is the report of the department's state worker, who says that in the rural districts she finds the homes of the crippled children cases above the normal average.

Directly related to social and home conditions is the question of broken families, which forms the biggest problem of the sick poor.

BROKEN FAMILIES—

1. Patient's father dead.....	26
2. Patient's mother dead.....	18
3. Patient's both parents dead.....	6
4. Patient's parents separated.....	12
5. Illegitimate cases	2
6. Orphans' home cases.....	19
<hr/>	
Total number of cases.....	83
Percentage of cases studied.....	55.33

Institutional Cases. This table indicates the large percentage of institutional cases included in so small a group of children as 150 cases. In addition to the 19 orphans' home cases which represent 9 different orphan asylums, 12 other cases mentioned represent 8 other institutions, including sanitariums and reform schools, making a total of 31 institutional cases among the total 150 cases.

CASE M. T. 4,252. This case is an illustration of one of the worst types of conditions found among the entire 150 dependent children studied, and the fundamental cause of the condition was a broken family situation. The case is a tiny shrunken girl of sixteen with tuberculosis of the hip, whose mother had died and whose father brought home different women at different times who posed as "mother" to the family. The father had a bad reputation and at one time served a two-year sentence at the penal farm. At the same time the two oldest girls were sent to the Indiana School for Girls on account of incorrigibility, and the younger children were sent to the Board of Children's Guardians' Home. Upon the father's release, he managed adroitly to get the children away from the Home and with another woman he settled down to housekeeping again. The home conditions were the most wretched and dirty imaginable, and the children were left uncared for and unfed most of the time,—a hopeless condition

for a child suffering with a tuberculous infection. Recently the father ran away with a feeble-minded woman and deserted the children so that once again they are in the Board of Children's Guardians' Home, where the patient will be required to have necessary medical attention.

Outside the sphere of this group of 150 cases it is interesting to note the number of crippled children in a few of the institutions in the state. The Indianapolis Orphans' Asylum sent in the following report, in response to a questionnaire:

SEX	AGE	GRADE	CRIPPLED CONDITION
Boy	17	8	Tuberculosis of the spine
Girl	13	4	Cleft palate and harelip
Boy	10	3	Crippled leg
Boy	11	5	Crippled leg
Boy	7	..	Tuberculosis of knee
Boy	2 mths.	..	Clubfeet
Boy	12	3	Crippled hands and feet

The Indiana State Tuberculosis Hospital at Rockville sent in a report of only two cases of cripples under eighteen years of age: two boys, aged fifteen and thirteen, both having tuberculosis of the hip.

The Indiana Soldiers' and Sailors' Orphans' Home sent the following report:

SEX	AGE	GRADE	CRIPPLED CONDITION
Boy	14	5	Tuberculosis of hip
Boy	8	2	Infantile paralysis
Boy	14	4	Tuberculosis of hip
Boy	11	4	Scoliosis
Boy	7	..	Muscular paralysis
Boy	12	4	Tuberculosis of hip

The Indiana School for Feeble-Minded Youth sent in a very interesting report which proves the definitions discussed in the chapter on causes of deformity. Out of a total of 49 cases of crippled children in this institution, 32 of the cases (68 per cent) are cases of spastic paralysis, which is the one cause of crippled condition among children affecting the brain and therefore nearly always including mental deficiency together with the paralyzed condition. It is interesting to note that in an institution for feeble-minded, the crippled inmates are predominantly cases of spastic paralysis. The other cases of deformity mentioned are as follows:

CRIPPLED CONDITION	NUMBER OF CASES
Diplegia	18
Hemiplegia	9
Paraplegia	5
Flat foot	5
Lordosis	3
Cleft palate	2
Talipes equinus varus.....	2
Anterior poliomyelitis	2
Torticollis	1
Kyphosis	1
Harelip	1
<hr/>	
Total	49

Sunnyside Tuberculosis Sanitarium gave a report of only 2 crippled children:—

SEX	AGE	GRADE	CRIPPLED CONDITION
Girl	9	1	Tuberculosis of elbow
Boy	13	6	Tuberculosis of ankle

Both of these cases are children who have previously received hospital surgical care for the tuberculous bone condition, and are now in the sanitarium because of a tendency toward pulmonary tuberculosis.

A questionnaire was sent to the Indiana Girls' School and the reply received stated that at the time there were no cases of cripples in the institution.

In Indiana there is no specialized institution for crippled children, but in various other states asylum homes for crippled children alone do exist, and their increasing lists of admissions seem to indicate that there is a distinct need for such specialized institutions. There are 13 of these asylum homes in the United States, the most ideal of which are the House of the Annunciation for Crippled and Incurable Children in New York City, and the New England Peabody Home for Crippled Children at Hyde Park, Mass.¹ Statistics compiled on the cost of plant per child per institution,² give \$1,085 as the average cost for an asylum home; and \$267 as the average cost per child annually for current expenses. Doubtless more adequate and complete equipment for these institutions would increase the cost per individual, but it is necessary to remember that they are specialized institutions, where each child re-

¹ Reeves, *Care and Education of Crippled Children*, p. 7.

² *Ibid.*, p. 99.

ceives individual attention and training. It is obvious that the crippled child has a greater chance to develop his resources in an institution where his handicapped condition is given consideration than in a general asylum where his handicap excludes him from all the normal occupation and competition of the other children. For cases of dependent children who are state wards, it is highly advisable to segregate the handicapped in an institution where they can be given special opportunities relative to their needs.

Social Agencies. All the cases referred to the Social Service Department need assistance in solving their social problems; circumstances have forced them to appeal for advice or help. Of these 150 cases of crippled children registered with the Social Service Department, 65 have no record of other social agencies following them; the remaining 85 cases have the following agencies registered as contributing to their improvement:

AGENCIES	NUMBER OF CASES REGISTERED
<i>In Indianapolis—</i>	
Charity Organization Society.....	15
Children's Aid Society.....	15
Board of Children's Guardians.....	13
Juvenile Court	8
Public Health Nursing Association.....	15
Woman's Improvement Club.....	1
St. Margaret's Guild.....	2
Flower Mission	4
Department of School Attendance.....	5
School nurses	7
Tuberculosis Clinic	3
Mother's Aid	5
Salvation Army	4
Y.W.C.A.	1
Red Cross Civilian Relief.....	1
Board of State Charities.....	2
Foreign Mission	1
W.C.T.U.	1
Tri-Kappa Society	3
<i>In Indiana—</i>	
Associated Charities, Elwood.....	1
Associated Charities, Wabash.....	2
Associated Charities, Marion.....	2
Associated Charities, Gary.....	2
Associated Charities, Franklin.....	1
Total	114

An attempt was made to determine the kind and amount of assistance contributed to these cases by a few of the agencies. For example, the Charity Organization Society sends visitors to the homes to learn as much as possible about the true situation; the workers coöperate with Employment Bureaus in attempting to solve the economic problem and bring the families to help themselves; material relief is given with the arrangement that the man of the family shall "work it out", and in emergency cases coal and groceries and money for rent are supplied freely. This description barely touches the high spots of the aid given to the families of these crippled children by the Charity Organization Society. Then, for example, the Children's Aid Association contributes largely to the assistance of the sick children. Milk is the only regular material relief supplied by this organization, tho many kinds of contributions are included besides. The chief connection of these crippled children with the Children's Aid is thru the arrangements for homes for many of the orphan cases, and temporary homes for some of the state cases needing convalescent attention which would make it difficult for them to come back and forth from their own distant homes. The counties from which the children come are responsible for financing their care, and the various counties pay the Children's Aid certain amounts for the support of the children. There is a state law fixing 40 cents per day as the rate for orphan children's care, but this amount varies for individuals, as in many cases the care of a badly crippled child requiring much attention is more expensive. On the whole, the relief agencies in Indianapolis and thruout the state are evolving the more scientific practice of trying to help the poor by solving and adjusting the social problems than by giving material relief.

Special agencies for the care of crippled children as distinguished from the care of other sick poor were first organized abroad. The first organization on record was founded in 1840 in Würtemberg, Germany, and following this chronologically societies developed in London in 1851; in Paris, 1853; in Zürich, 1864; in Copenhagen, 1872; in Milan, 1873; in Dublin, 1874. Pioneer scientific work was begun by the Copenhagen Institution, which soon developed widely, and included a surgical department and industrial training department. Due to the enormous number of rachitic children in Italy, or-

ganized assistance for cripples became a necessity in connection with the education departments. The association for the care of cripples here also soon became closely affiliated with hospitals where the physical care could be given. In England, one of the earliest organizations for the care of cripples was the Birmingham Crippled Children's Union, which is responsible for the development of specialized hospitals and employment bureaus for the assistance of this handicapped group of children.

In the United States special agencies interested in crippled children were first organized in the East during the last decade of the nineteenth century. In 1893 the Industrial School for Crippled and Deformed Children was founded in Boston; and in 1898 the Guild for the Crippled Children of the Poor with its several auxiliaries was founded in New York City. More recently, the most specialized agency of its kind, the Association for the Care of Crippled Children, was organized in New York City also. Its work consists in seeking and bringing to the hospitals all the crippled children in the poor districts of New York; in coöperating with milk stations, schools, and district clinics for the necessary care of the deformed children; and especially in coöperating with the hospitals in the after-care of (local) cases after their discharge from the hospitals. There are other agencies devoted to the group of crippled, but their work is so closely connected with either hospitals or schools that they can be included in the discussion on education and hospital care.

IV. HOSPITAL CARE

THE hospital cases of this entire group of 150 children include 128 orthopedic cases which have received free care in the Robert W. Long Hospital since its opening. This number of children is not quite 3 per cent of the total admissions to the hospital since its opening over four years ago. The small percentage of orthopedic cases indicated is not a true reflection of the number of cases seeking admission to the hospital. This fact is not surprising, however, when it is considered that the Long Hospital is very small at present with a capacity of only 88 free beds, and also that it is a general teaching hospital, where varieties of cases are sought, and consequently where orthopedic cases requiring long tedious convalescence are not so willingly admitted. The objection to orthopedic cases in a general hospital on the ground of their long stay is illustrated by the statistical estimate of the total number of days spent in the hospital by the 128 cases included in this study. Estimating from the dates of admission and discharge of all the cases, the total number of days was found to be 17,572, which time when reduced to over 48 years seems a startling fact! From these figures it is deduced that the average time spent in the hospital by each patient was 137 days, but as a matter of fact the length of time spent by individual cases varied all the way from the minimum, 1 day, to the maximum, 1,137 days.

CASE J. A. 2,955. This case (see Illustration I)¹ is the little boy with Pott's Disease who remained in the hospital 1,137 days, the longest time spent in the hospital by any of the 150 children. This little lad's condition was so alarming when he first entered that it took many months to start him on the road to recovery; and, when finally started, it was impossible to send him as a convalescent to a neglected home where a drunken father and several rowdy sisters and brothers would soon undo all the good work that had been accomplished in the hospital. So this boy was an exceptional case and was kept under careful observation and treatment until his condition was considered safe. He received only the normal convalescent care which should be given to every ortho-

¹ See p. 17.

pedic case, but which would require a special convalescent institution for its practice.

The cost to the state of maintaining a child in the Robert W. Long Hospital for 1 day has been approximated at \$2.40. Estimating from this average cost, the total expense to the state for the care of these 128 cases has been a total of \$42,172.80. The average expense of each of the 128 children has been about \$329.47, which amount again ranged for the individual from \$2.40 to \$2,718.80, the latter for Case J. A. The expense of each of 2 cases of the total 150 was over \$2,000, and that of each of 5 cases was over \$1,000, showing that the cost of treatment amounts up very rapidly.

Happily these children do not complain of suffering much pain during their treatment, and the greater part of their stay in the hospital is spent in wheeled chairs or sitting up in bed able to be occupied and to play. For some of the cases that remain many months in the hospital there is an urgent need for regular hours of school work. In this way the child would not drop so far behind in his or her regular grade, and the days would hold more interest with a bit of regular work included. The Massachusetts Hospital School at Canton, Mass., illustrated the success of the combination of hospital care and education; but the cases admitted there are supposedly on the road to recovery, and the institution lays particular emphasis on the educational care, a required course of study being prescribed before a child is discharged from the institution. This hospital has a capacity for 300 children. The average age of admission is nine years, and the average length of stay is five years. As already mentioned,² this institution has estimated that the majority of its cases of crippled children are due to tuberculous bones and poliomyelitis. Clinics are held there for the Medical School of Harvard University, and surgical treatment is given to the patients. The cost per capita weekly was estimated in 1917 to be \$6.56, the total maintenance for the year 1917 having been \$93,125.27. This institution is one of the most recent developments of specialized care for crippled children.

In a survey by the Russell Sage Foundation in 1914 of the care and education of crippled children in the United

² See p. 16, Note 10.

States,³ it was found that there were 10 orthopedic hospitals and 14 convalescent hospitals in the United States at that time, and there is no available record of new institutions erected since that time, probably due to the World War. From this publication a quotation from page 8 is worthy of the reader's attention. "We have no hesitation in advocating the creation of a state hospital for crippled children in every state in the Union." This wholesome recommendation will take many years before its realization is attained, but gradually the different states are awakening to a consciousness of the situation. Minnesota was the first state to establish a hospital exclusively for crippled children in 1897, under the control of the State University Medical College. Statistics from the records of the Minneapolis Hospital show that three-fourths of the cases of deformity admitted were caused by disease, nearly 75 per cent by tuberculous infection.

New York was the second state to erect a state hospital for crippled children in 1898, but this hospital has been less appreciated and known than the many private institutions previously established. The one field in which the Haverstraw State Hospital does excel pre-eminently is in the care of the rural cases which are not for the most part included in the other hospitals. Of the private orthopedic hospitals in New York, some of the most prominent are the New York Hospital for Ruptured and Crippled, the New York Hospital for Deformities and Joint Diseases, and the Children's Orthopedic Ward in the Post-Graduate Hospital. The Hospital for Ruptured and Crippled averages between 4,000 and 5,000 new patients annually. The crowded and insanitary living conditions in the poorer districts of New York City are the obvious cause for such an enormous percentage of deformed children with tuberculous infection of the bones.

The complete list of all the children's orthopedic hospitals in the United States in 1914 is given as follows:⁴

³ Reeves, *Care and Education of Crippled Children*, p. 2.

⁴ *Ibid.*, pp. 141-157.

STATE	YEAR OPENED	AVERAGE NUMBER OF CHILDREN	HOSPITALS
Maine (Portland).....	1908	57	Children's Hospital.
Minnesota (St. Paul).....	1897	63	State Hospital for In- digent Crippled and Deformed Children.
Nebraska (Lincoln).....	1905	70	Nebraska Orthopedic Hospital.
New Jersey (Newark).....	1891	45	Home for Crippled Children.
New Jersey (Orange).....	1903	10	New Jersey Orthope- dic Hospital and Dispensary.
New York (New York City)..	1906	49	Hospital for Deformi- ties and Joint Dis- ease.
New York (New York City)..	1863	192	Hospital for the Rup- tured and Crippled.
New York (New York City)..	1866	62	New York Orthopedic Dispensary and Hospital.
Washington (Seattle).....	1907	27	Children's Orthopedic Hospital.
Illinois (Chicago).....	1892	87	Home for Destitute Crippled Children.

After the infantile paralysis epidemic in 1916, there were approximately 15,000 crippled children left with the stamp of paralysis. It was natural that at this time greater interest should be taken in providing adequate measures to relieve these handicapped youngsters, and in securing every possible treatment that human care could supply. But during war time building of every kind was suspended, and the expense of establishing hospitals was prohibitively high. In 1914, in the above-mentioned Russell Sage Foundation Survey, an estimate was determined of the cost of orthopedic hospitals.⁵ The average cost of hospital per child was found to be \$2,747, and of a convalescent hospital \$1,294. The current average expense annually per child was estimated for hospitals at \$570, and for convalescent hospitals \$348. In this connection

⁵ Reeves, *Care and Education of Crippled Children*, p. 99.

it is interesting to observe a table of the cost of certain institutions, the sources and amounts of the funds obtained.

TABLE SHOWING SOURCES AND AMOUNTS OF PUBLIC FUNDS FOR FIFTEEN INSTITUTIONS⁶

HOSPITALS	PUBLIC FUNDS	
	Source	Amount for 1 Year
Maine (Portland), Children's Hospital.....	State....	\$10,000
Minnesota (St. Paul), State Hospital.....	State....	\$13,943
Nebraska (Lincoln), Orthopedic Hospital.....	State....	\$45,060
New Jersey (Newark), Home for Crippled Children.....	City....	\$2,500
New York (New York City), Hospital for Deformities and Joint Diseases.....	City....	\$7,730
New York (New York City), Hospital for Ruptured and Crippled Children.....	City....	\$22,801
CONVALESCENT HOSPITALS		
Maryland (Baltimore), Children's Hospital School.....	State.....	
Maryland (Baltimore), Kernan Hospital School for Crippled Children.....	State....	\$3,750
Massachusetts (Canton), Massachusetts Hospital School.....	City....	\$5,000
Minnesota (St. Paul), State Hospital School for Crippled Children.....	State....	\$11,398
New York (Garden City), House of St. Giles the Cripple.....	City....	\$6,495
New York (Port Jefferson), St. Charles Hospital for Crippled Children.....	City....	\$19,294
New York (West Haverstraw), State Hospital for Crippled Children.....	State....	\$24,437
Pennsylvania (Pittsburgh), Industrial Home for Crippled Children.....	State....	\$5,000
Pennsylvania (Sewickley), Fresh Air Home....	State....	\$552

⁶ Reeves, *Care and Education of Crippled Children*, p. 104.

The importance of convalescent hospitals cannot be over-emphasized. The best of surgical treatment is inadequate unless followed up by after-care in which every detail of progress and development is watched and treated accordingly. If a patient is discharged to return to a neglected home, all the attention and care expended on him in the hospital are wasted,

for relapses quickly occur if the technicalities of after-care are neglected. Since a hospital proper is not prepared to keep these orthopedic cases for the long convalescent period, there is an urgent need for regular convalescent hospitals or homes. The demand for this intermediary care is particularly urgent for rural cases such as constitute the majority of the Robert W. Long Hospital cases. As an example, recently a little girl (Case L. F. 6,528) with double hip joint disease was ready for discharge from the hospital, as she had received her braces and crutches and no longer needed hourly attention. This child lived in a remote corner of the state, and the chances of returning for regular examinations every few weeks if sent home were slight. In this instance, the Social Service Department bridged the difficulty, by securing permission thru the child's native county to place her in a Children's Aid Association boarding-home in Indianapolis till the convalescent period had passed. Just exactly at this point is obvious the need for a convalescent institution where such cases can be transferred directly from the hospital. Tho Indiana is lacking in such a necessary and valuable institution, there are 14 in other parts of the country, named as follows:

STATE	YEAR OPENED	AVERAGE NUMBER OF CHILDREN	CONVALESCENT HOSPITALS
Illinois (Chicago).....	1911	40	Convalescent Home for Destitute Crippled Children.
Maryland (Baltimore).....	1912	30	1. Children's Hospital School.
..... (Baltimore).....	1895	53	2. Kernan Hospital and Industrial School for Crippled Chil- dren.
Massachusetts (Canton)...	1907	229	Massachusetts Hospital School.
Michigan (Detroit).....	1907	25	Van Leuven Brown Hos- pital School.
Minnesota (Phalen Park)...	1910	38	Minnesota State Hospital and School for Indigent Crippled and Deformed Children.

STATE	YEAR OPENED	AVERAGE NUMBER OF CHILDREN	CONVALESCENT HOSPITALS
New York (Coney Island) ..	1904	42	1. Sea Breeze Hospital.
..... (Garden City) ..	1891	45	2. House of St. Giles the Cripple.
..... (Port Jefferson) ..	1907	110	3. St. Charles Hospital for Crippled Children.
..... (West Haverstraw)	1900	61	4. State Hospital for the Care of Crippled and Deformed Children.
..... (White Plains) ..	1904	94	5. Country Branch and Industrial School of the New York Orthopedic Dispensary and Hospital.
Pennsylvania			
..... (Philadelphia)	1906	96	1. Widener Memorial School for Crippled Children.
..... (Pittsburgh) ..	1902	45	2. Industrial Home for Crippled Children.
..... (Sewickley) ..	1897	27	3. Sewickley Fresh Air Home.

Institutional cases of crippled children are registered and statistical information in regard to them is more readily obtained than concerning non-residential cases. However, it is known that the number of "out patients" far exceeds the number of institutional cases receiving surgical care. "The most important provisions for medical supervision of crippled children not living in institutions are the dispensary services."⁷ Statistics comparing the number of admissions of 9 dispensaries and the 37 crippled children institutions shows "a total of 34,392 different out-patients—as against 4,901 patients resident in the entire 37 institutions".⁸ A statement made by many surgeons is "that while dispensary care may be adequate for some cases, it can be safely substituted for institu-

⁷ Reeves, *Care and Education of Crippled Children*, p. 33.

⁸ *Ibid.*, p. 34.

tional care only when the child is actually brought to the dispensary as frequently as the doctor orders, and when his directions for care at home are carefully followed".⁹ It might be suggested that dispensary care for cases not having active disease might be more satisfactory if accompanied by a careful system of social service "follow-up" care, whereby the responsibility of the patient's regular return to the dispensary would be undertaken by the social service department workers, and the expense of salaries for social service workers would be far less than the expense of institutional upkeep.

Social service workers are also valuable in keeping in touch with patients after discharge from hospitals or convalescent homes. Incidentally "it is a most encouraging feature that 15 out of the 37 institutions (for crippled children) maintain some helpful supervision of their patients after discharge."¹⁰ This field of "follow-up" care is one of the most important points to be emphasized in this study, because it is fundamentally the purpose of medical social service to help in adjusting the social situation where illness interferes with the normal routine; and at the same time to leave a permanent stamp of improvement and general gain in the family or community approached.

⁹ Reeves, *Care and Education of Crippled Children*, p. 34.

¹⁰ *Ibid.*, p. 106.

V. EDUCATION

THE mentality of crippled children is in the greatest percentage of cases normal, and yet they are deprived of their rightful heritage of a public school education because of their physical disability to attend school. Before giving the result of this survey, it seems worth while to mention the results of a mental examination given to 80 crippled children at the Phalen Park Hospital for Crippled Children in St. Paul.¹ The intelligence of the children "was expressed as Dr. Kuhlmann suggested, by his rate of mental development as compared with the average normal rate".² The following classification was made:

17 cases.....	above normal
38 cases.....	normal
15 cases.....	slightly below average
3 cases.....	borderline
7 cases.....	feeble-minded

This rating resulted in 87½ per cent of the children proving to have satisfactory mental development. "It is significant that in 40 out of 62 cases the Binet scale classified the child according to his mental age in the regular grade prescribed for an average child of that age."³ Considering the handicap that a crippled child has to struggle against, this rating would seem extraordinarily high.

It was impossible to obtain scientific mental tests of the 150 children in this study, so that the mental proficiency has been estimated only relatively. Out of the 150 cases, 7 cases, or 4 2/3 per cent, have a diagnosis of mental deficiency attached to them; and of these 7 cases, 4 are cases of spastic paralysis, which again illustrates the brain affection in these cases. The total 150 cases include 101 cases of school age, that is, over six years of age. Of these 101 cases, 78, or 77 per cent, have records of school attendance, with the number of children in each grade as follows:

¹ *American Journal of Care for Cripples*, Vol. III, No. 4. p. 190.

² *Ibid.*

³ *Ibid.*, p. 194.

GRADE	NUMBER OF CHILDREN
1	12
2	12
3	12
4	10
5	9
6	7
7	5
8	6
First year high school.....	4
Kindergarten	1
<hr/>	
Total	78

The cases of school age and yet not attending school includes children who live in the country too far away from the schoolhouse to be able to reach it; children who are not even able to walk the short distances to the schools in the city; and children who could reach school, but are unable to climb the stairs.

CASE M. F. 3,107. This case is a bright little girl with both legs paralyzed as the result of infantile paralysis, who lives directly across the street from a schoolhouse, and always enjoyed going to school enthusiastically. When she reached a certain grade, however, she was obliged with her class to go up and down stairs several times during the day, and in order to do this, the child needed someone to help her each time. At first a little friend or two helped her, but children are thoughtless and unkind, and most of the time they forgot her, and the teachers were all too busy to pay any attention to her pitiful struggles in climbing the stairs. Frequently the child's mother came across the street and helped her; but she did this most unwillingly, and constantly urged the child to stop school. With discouragement from her mother, the child will doubtless soon stop school, whereas if there were a school arrangement whereby she could attend her classes on the ground floor, she could go thru school and be fitted eventually to earn her living more efficiently and more lucratively.

A survey of the number of crippled children in the Indiana public schools in April, 1919, brought the estimate of 222 cases out of the total 30,508⁴ children attending school, .7 per cent. This percentage indicates not that there are few crippled children, but that only a few of these are able to

⁴ Report of Indianapolis Public Grade Schools, March 31, 1919.

attend the regular schools because of physical disability. The questionnaire distributed among the schools demanded only the barest layman's description of the crippled conditions of the children. The reports of the physical deformities are given as follows:

CRIPPLED CHILDREN	NUMBER OF CASES
Deformed hand	16
Deformed arm	19
Deformed feet	34
Deformed leg	63
Deformed back	30
Deformed hip	5
Deformed neck	4
Amputated leg	4
Amputated arm	3
Rickets	1
Infantile paralysis	25
Paralyzed hand	1
Paralyzed arm	14
Paralyzed foot	5
Paralyzed leg	30
Paralyzed back	3
Paralyzed hip	1
Paralyzed face	1
Congenital paralysis	2
Speech defect	2
Tuberculous bone condition named.....	4

The mental development of these 222 school cases was estimated merely in an approximate manner from the reports of ages and grades as follows:

AGES IN YEARS	NUMBER OF CASES
6	11
7	24
8	31
9	21
10	38
11	18
12	23
13	16
14	18
15	19
16	2
17	1

Total.....222

The average age of these 222 crippled children is estimated from these figures to be ten years.

GRADES	NUMBER OF CASES
Defective school	1
Special school	1
1 grade	34
2 grade	37
3 grade	35
4 grade	33
5 grade	22
6 grade	20
7 grade	17
8 grade	22
Total	222

The average grade for these 222 cases is estimated from these figures to be the third grade. Considering that the age average is ten years, this grade average indicates only a slight degree of retardation. The responsibility of watching the physical condition of the school children is thrown chiefly on the school nurses, tho attending physicians visit the schools at specified intervals. The school nurse is overworked with eye and ear, nose and throat cases needing prompt attention, so that only rarely does she have time to look after the welfare of non-acute crippled cases. These cases should be segregated and receive special care.

Special Schools. The solution of the problem of the cripple and his education lies in the establishment of special schools. Abroad special schools for cripples were organized long before they were considered in the United States.⁵ By the middle of the nineteenth century Germany had established a system of educational and industrial training schools. In 1872 Denmark established the model European School in Copenhagen, with a curriculum of academic schooling, industrial training, physical treatment, recreational outing, and resident home for out-of-town cases. In Sweden, a system was evolved whereby the school teachers visited the homes of the crippled children after school hours and gave them instruction at that time. In 1886 Great Britain began to develop a special school system for her crippled, and made rapid strides, till in 1900 special schools under the National Board of Education became a part of the regular school system.

In the United States, the first special school for cripples was established in Boston in 1893—an industrial school for

⁵ Munroe's Encyclopedia, Vol. II, pp. 230-234.

crippled and deformed children. Later in 1907, the Massachusetts Hospital School at Canton (already mentioned) was established for the physical care and education of deformed children. In New York City, the Children's Aid Association established the Henrietta Industrial School for Cripples in 1898. This first attempt to help these disabled children was looked upon with suspicion by the ignorant and especially foreign-born mothers, until their confidence was won and they realized that only kindness and help was intended by the visiting nurses and teachers. Really valuable social work was accomplished by the Henrietta and other Children's Aid Day Schools, in the education of mothers as well as of children. "Mothers' meetings" were held regularly and the hygiene and general information taught the ignorant mothers was a permanent benefit. In 1904 the Unitarian Lenox Avenue Church established a day home and school for crippled children where academic and manual training were taught and summer outings, transportation, and lunches were offered. In 1912 the City Board of Education took over all the expenses of this school except the lunches and medical supervision, which expenses were still met by private subscription. The other foremost special schools in New York are the East Side School where about 200 children are cared for; the William H. Davis Free Industrial School; the Rhinelander Free Industrial School; and a Boat Class, taught on board a river boat where the children can be kept constantly in the open air. Recently, the City Board of Education has incorporated many of the private schools and established new special schools or classes for crippled children as a part of the public school system in New York. In Chicago, Graham H. Harris introduced the Special School for Cripples, and recently the City Board of Education has assumed the control of this department, appropriating \$12,000 annually for the upkeep of equipment and the necessary medical care for the children.

All of these above-named special schools for cripples include about the same general plan and equipment. First, and foremost, medical supervision with provision for dispensary or hospital treatment is provided, including visiting doctors, and nurses always present to carry out the doctor's instructions. Transportation is furnished, so that all the disabled children can be collected by bus and carried to and from school. Hot noon lunches are provided for the double purpose of avoid-

ing the extra trips home, and of assuring each child of at least one nourishing meal during the day. As a part of the school equipment, ground floors only are used or elevators provided, and adjustable desks and seats are arranged so that every possible comfort can be secured for the variously deformed children. Shorter hours to meet the subnormal physical strength of the children are prescribed; and individual attention is given in order to give each different child an evidence of personal interest in his development and progress. Every city and town should offer the facilities of a special school or at least special ground floor rooms with the necessary equipment for crippled children. It has been estimated approximately that such schools incur an expense of \$50 annually per child. For rural cases, institutions such as the Massachusetts Hospital School where both physical and mental care can be provided are recommended. Of the 37 institutions mentioned in the Russell Sage Foundation Survey, 29 maintained a school department; and of these 29, only 7 departments were supplied with teachers by the local public school board. For city cases, wherever a child can be given the necessary attention at home and receive adequate medical care at a dispensary, the special day school system is preferable to the institutional.

The importance of vocational training is a part of education, tho it is also closely associated with the employment question which will be discussed in the next chapter. Early vocational training can be given in the schools as part of the curriculum. For girls, sewing, weaving, pottery, etc., are the commonest occupations taught in the schools; whereas the boys are taught various kinds of manual training, bookkeeping, etc., according to their respective capacities. Since crippled children have to struggle against a disadvantage all the way thru life, they are never too young to begin to learn some specialized work in which practice will enable them to become experts. Tho it is not right or fair that the academic education of these handicapped children should be abbreviated or neglected, yet part-time vocational training can be given them and after a public school education has been completed an intensive course in industrial training should be required before graduation, in order that each child may start out adequately equipped to be self-supporting.

VI. EMPLOYMENT

EMPLOYMENT is the key to economic independence and incidentally to happiness. The traditional idea that sick or disabled people must be kept in idleness is nowadays exploded; for it has been agreed that the psychic mental attitude of the sick has a decided effect on their physical condition. Idleness leads to introspection and boredom, whereas a certain amount of occupation proportionate to the individual condition has proved a real blessing to the convalescent and invalid. The very recent experiment of occupational therapy introduced in the United States base hospitals has carried out this theory and has proved gratifyingly successful.

It has been only of late years that the cripple played any part in the field of industry. His disability automatically excluded him, and his natural sensitiveness instinctively forbade his boldly pushing forward and claiming just recognition. Enforced idleness naturally augmented the cripple's sensitive retirement and morbidity, and he was obliged to realize that in many cases he was a burden in a wage-earning family. The only occupation sometimes practiced by the cripple was begging or peddling, and this source of livelihood is a menace to any community. There is no reason whatever why a cripple not too extensively handicapped should not learn a trade and get a job. The range of choice of occupation is naturally more limited, depending on the nature of the individual disability. "A cripple is only debarred by his disability from performing certain operations. In the operations which he can perform, the disabled man will be just as efficient as his non-handicapped colleague, or more so."¹ Vocational training is an essential prerequisite for the cripple entering the industrial field, inasmuch as his limited physical versatility narrows the number of occupations in which he can seek work, and therefore he must needs become an adept in specialization in order to hold his own in the competition field. It is a vital social work to encourage cripples while still children to become interested in some line of work which will lead to a future incentive toward employment. The greatest tact is necessary to persuade a growing crippled child that he or she can become an asset in the community

¹ *American Journal of Care of Cripples*, Vol. VI, No. 1, p. 146.

and really amount to something. Once ambition is conceived, the rest of the task of encouraging the individual to work is an easy one. Even the most limited variety of occupation offers some choice so that the individual's taste and interest can be consulted. The crippled child should be taught that he is a normal human being and not altogether an alien on account of his physical difference.

Potentially he is a normal child, full of creative ability, energy, and affection. Neglected he becomes mentally and abnormally deficient. . . . Give the crippled boy a chance and two results follow: freeing a child's soul from a false sense of inefficiency, and society from a burden.²

Efficiency can and is attained by the crippled worker as well as the normal, provided the former has had training and has chosen work suitable to his capacity. It has been suggested that skilled occupations where quality of production is of more importance than quantity are best adapted to cripples; but this limitation would not necessarily hold good, as in some occupations a cripple, if adapted to his work, can work just as rapidly as his average competitor.

The education of employers to a true realization of the cripple's situation and capabilities is an important part of the great work of transforming the cripple from a beggar and misanthrope into a self-respecting, self-supporting citizen. Most of the employers have always been too busy and unsympathetic even to give a crippled worker a chance to prove his ability; and a few have given jobs purely out of a sense of philanthropy, in the days when the cripple did not have a chance to receive vocational training. Now, however, the purpose of broad-minded, socially-wise people is first to secure vocational training for the disabled, and then to prove to the employers that the work offered by these people is just as competent as that of any average man or woman. With the readjustment of soldiers from military to civilian and industrial life, every effort has been made to prevent the wholesale placement of the crippled man in jobs offered to them thru a spirit of patriotism and sympathy, and which they could never hold in equal competency against trained and experienced men. Such jobs could not be permanent, and it is to prevent the future chaotic readjustment which would natur-

² A. L. Lewis, "The Toy Industry", in *American Journal of Care for Cripples*, Vol. VII, No. 2, p. 152.

ally result from such placements that the reconstruction department of the army has not only offered but compelled disabled men to accept a vocational training course before discharging them from the army. The message which everyone who is interested in the welfare of the cripples should attempt to impress on the employer is that "the positive duty of the employer is to find for the disabled man a constructive job which he can hold on the basis of competence alone".³

The special trades adapted to cripples include a longer list than would on first thought be imagined. A cripple disabled in the feet or legs has of course a larger choice of occupations than the one who has lost the use of his hands or arms. Among the children's industrial schools, the commonest occupations taught are sewing, basketry, pottery, etc., for the girls; wood carving, carpentry, cobbling, etc., for the boys. Toy manufacture has recently been suggested as an excellent trade to teach these crippled children, both on account of the enthusiastic interest it would arouse among the children and on account of the demand for toys in the market since the usual large supply from Germany has been cut off. Other trades can be learned by cripples, the most important of which have been included in the training school shop of the Red Cross Institute for Cripples, where their efficacy and success have been tested. These include type-setting and printing, manufacture of artificial limbs, mechanical drawing and drafting, acetyline welding, jewelry making, and cinematograph operation. In connection with the vocational training school, the Red Cross Institute Supports a special employment bureau for cripples, which keeps in touch with all the other employment bureaus in New York City, and also is doing a bit of unostentatious pioneer work in educating the employers to a realization of the cripples' value in certain lines. The Red Cross Institute has discovered that in connection with the industrial cripple, the workmen's compensation law as it is now interpreted is more of a detriment than a benefit to the victim it is intended to help; for it makes no provision for a man's rehabilitation training in a new field of labor other than the one shut off from him by his acquired disability; and the tendency is for a man to loaf while the compensation is being paid out to him. When the term of

³ *American Journal of Care for Cripples*, Vol. VI, No. 1, p. 146.

its payment expires, the man is left stranded, and it is at this time that the Red Cross Institute receives such men as applicants for the trade school. There is eminent need of a revision of the compensation laws. This field of industrial cripples includes not only adult men and women, but also children over fourteen years of age very often. The reports of the Industrial Board of Indiana of industrial injuries have since January, 1919, included a separate statement of conditions among juveniles of sixteen years and under. The reports for January and February gave 75 and 62 cases respectively of injuries to children under sixteen years of age reported. The list of industries engaged in, causes of accidents, and kinds of injuries is too long to quote in detail, but in relation to a study of crippled children it is interesting to note here the number of orthopedic injuries. In January the following list occurred:

	CASES
Loss or amputation.....of 1 finger.....	3
Loss or amputation.....of all fingers, one hand.....	1
Fracture or broken.....arm	2
Fracture or broken.....1 finger	1
Fracture or broken.....1 foot	1
Crushed .....hand	1
Crushed .....1 finger	2
Crushed .....1 toe	1
Crushed .....3 toes	1
Total	13

For February, the following list occurred:

Loss or amputation.....1 finger	2
Fracture or broken.....1 leg	1
Fracture or broken.....1 ankle	1
Crushed .....1 finger	3
Crushed .....1 toe	1
Total	8

The ages of the children injured were as follows:

JANUARY		FEBRUARY	
<i>Years</i>	<i>Number of Cases</i>	<i>Years</i>	<i>Number of Cases</i>
14	4	14	4
15	7	15	8
16	64	16	50

Tho the numbers of this orthopedic selection are small, yet the mere existence of any figures at all accounts for a few of the multitude of cripples and otherwise disabled children. The country-wide agitation against child labor and for child welfare is helping everywhere to ameliorate conditions for children and to raise the age standard of employment.

The employment question has scarcely been touched upon in this study of 150 crippled children, because low average age has excluded all but 5 cases from consideration from this point of view. The following cases have records of employment:

SEX	AGE	PHYSICAL DIAGNOSIS	OCCUPATION	WAGE
Girl (colored).	18	Amputation of leg.....	Running elevator...	\$20 per month.
Girl (colored).	17	Amputation of leg.....	Running elevator...	\$32 per month.
Boy.....	16	Osteomyelitis of hip.....	Farm hand.....	\$32 per month.
Boy.....	16	Clubfoot.....	Grocery delivery boy.....	\$6 per week.
Boy.....	16	Scoliosis.....	Peddling and begging.....	\$5 to \$25 per week.

CASE R. W. 6,109. This case is the last one mentioned above, a crippled boy known all over Indianapolis because of his begging and peddling propensities. He should not legitimately be classed among the wage-earning but his case is cited to point out the mistake in neglecting both to offer and enforce some form of vocational training for such crippled children. This boy belongs to a neglected, ignorant family of the most destitute type. His father recently deserted the family but the court forces him to pay a certain regular amount for its support. The boy himself is badly hunchbacked from curvature of the spine. He has been brought up in Juvenile Court for truancy and for stealing, and he is known to almost every social agency in town. Every effort has been made to get him a job and urge him to stick to it; but since he has

never had any industrial training, his beginning wages are naturally low, and he always refuses to remain at a job steadily because he knows he can make more money by begging or peddling, his boast being that he occasionally makes as high as \$25 per week! This child is so confirmed a vagrant that it is doubtful whether ordinary measures will solve his problem now. It will take an extraordinary person or circumstances to lead him into the paths of righteousness and a sane economic life!

The development of free and semi-enforced vocational training and a recognition of the cripple on an equal basis as his normal competitor in the field of industry will help to prevent the development of such cases as R. W. to lessen the drain on community charity; and to substitute self-respecting, economically independent citizens for one of the groups of useless dependents.

VII. SURVEY AND LEGISLATION

IN order to obtain public support and interest in a bill before the legislature, it is necessary first to secure authentic data and figures on the subject at issue. Therefore before making an effort to pass reform laws to alleviate and improve conditions for crippled children in any locality, a survey of existing conditions and its publication is an excellent way of making known the need for legislation. The survey of all the cripples of Cleveland, Ohio, in 1916¹ serves as a fine illustration of the value of such pre-legislative agitation for a social reform.

The Cleveland Survey included adults as well as juveniles, but only the results of the investigation of juvenile conditions will be mentioned here, in keeping with the limitations of this study. Crippled children under fifteen years of age to the number of 936 were discovered. Their physical deformities were diagnosed as follows: 16 per cent congenital, 9 per cent results of accidents, 15 per cent tuberculous bone and joint disease, 41 per cent infantile paralysis, and 16 per cent results of other diseases. A survey of the educational situation of the children between five and fifteen years of age gives the following estimate:

SCHOOL ATTENDANCE ²	NUMBER	PER CENT DISTRIBUTION
Total	771	100 per cent
At public school.....	525	68 per cent
Regular classes	415	79 per cent
Special classes	110	21 per cent
Not at school.....	246	32 per cent

The survey stated that there were 4 institutions for crippled children in Cleveland:

1. Rainbow Hospitalcapacity 50-85 cases..School instruction.
2. Holy Cross House.....capacity 50 cases..School instruction.
3. Willson School Classes..capacity 110 cases..Special school.
4. Sunbeam AssociationPromotion of Aid for Cripples.

These few facts from the Cleveland Survey serve the purpose of indicating the general plan of its investigation. At

¹ Publication of the Red Cross Institute for Crippled and Disabled Men, Series II. No. 3.

² A Survey of Cripples in Cleveland, Ohio, in 1916, p. 43, Red Cross Institute Publication.

the time it was made, Ohio had the following laws which touched on the situation: (1) maintenance of a special school for crippled children; (2) appointment of teachers to this school just as to other regular public schools; (3) compulsory attendance of crippled children at special school; and (4) medical inspection of these children. The fruits of this survey are seen in an editorial from a Cleveland newspaper on March 20, 1919, which is quoted as follows:

The present Legislature can hardly refuse to help along the movement for a state institution for crippled children. The Legislature two years ago without a dissenting vote took the initial step by appropriating \$90,000 with which to start the work. But before a beginning could be made America entered the war, and practically all public construction was stopped. The appropriation of \$90,000 has since lain untouched in the State treasury. All the present Legislature has to do is to reappropriate this \$90,000. No project with more real merit behind it has come before the Legislature for years. The State provides liberally for its blind and deaf children. Yet there are today more than 2,000 crippled children in Ohio, practically all of whom should become wards of the State so that they can have expert treatment, be educated properly, and be trained to become self-supporting citizens.

This plea brought the desired results, as the Ohio state legislature did pass the bill reappropriating the \$90,000 for the establishment and organization of an institution for deformed and crippled children, and the commission appointed to carry out the plan of this bill remained on the same status, with the prospect of commencing constructive operations at once assured.

Legislation in Various States. Laws directly in reference to the care of crippled children have been passed in 11 states, and the gist of their respective appropriations and enactments is as follows:

Florida. 1. Erection of a hospital for indigent crippled children by the State Board of Health. 2. Annual appropriation of \$10,000 for maintenance.

Illinois. 1. Authorization of Surgical Institution for Children under fourteen unable to pay for private surgical care.

Iowa. 1. Power vested in Juvenile Court to compel medical and surgical treatment for children under sixteen. A. Free treatment at State University Hospital for patients unable to pay.

Massachusetts. 1. Appropriation for Massachusetts Hospital School for Crippled and Deformed children, under supervision of State Board of Charities.

Michigan. 1. Appropriation for two cottages for treatment and education of crippled children at State Public School at Coldwater. 2. Power of commitment to school vested in Probate Court.

Minnesota. 1. Appropriation for State Hospital for crippled children.

Nebraska. 1. Appropriation for equipment of a hospital for crippled children.

New York. 1. Appropriation for State Hospital for care of crippled children. A. No admission for incurables. B. Admission only for patients unable to pay.

Ohio. 1. Appointment of commission to buy land for hospital for treatment and education of crippled children.

Oregon. 1. Compulsory medical examination of crippled children under sixteen, at discretion of judge of county court. 2. Free treatment and transportation at hospital of University of Oregon Medical School.

Wisconsin. 1. Provision for admittance of crippled children to State School for neglected and dependent children. 2. Provision for medical supervision of such cases.

The state of Indiana has no law governing the care of crippled children specifically. The only law which can be interpreted to include such provision in a general way is an "Act (1907, Chapter 41) defining a dependent child and a neglected child, and providing for their custody and the punishment of any person responsible for, or in any way contributing to, such dependency or neglect".³ The definition of "neglected child" in this law includes girls under seventeen, and boys under sixteen, "who have not proper parental care or guardianship",⁴ but it does not specifically include mention of the uncared-for sick children; so that its terms are not by any means adequate. There is an appalling need for laws controlling the care of dependent crippled children, and if a survey were made in Indiana such as was made in Cleveland, the statistical figures for Indiana would prove to be proportion-

³ Laws Concerning Children, compiled by State Board of Charities, March 1, 1914, p. 6.

⁴ *Ibid.*

ately high. A recommendation for legislative provision for the care of crippled children in Indiana would include the following clauses:

1. Compulsory medical and surgical attention for all children physically abnormal. (A) Including report and examination of cases thru public schools and district system of public health nurses.

2. Adequate hospital provision for children.

3. Convalescent hospital institution for crippled children, with educational department coördinating.

4. Establishment of special schools with special equipment for crippled children thruout the state.

5. Provision for free vocational training for crippled children with departments adapted to various forms of handicaps.

CONCLUSION

THE adjustment of handicapped individuals to a life as nearly similar to that of the normal as possible is a social problem worthy of investigation and realization. It is amazing to consider that the majority of normal average people never give a thought to the large number of handicapped individuals with whom they come in contact. People are not intentionally selfish and unkind; they are busy and ignorant! A social problem such as the one of crippled children dealt with in this study needs public education in regard to it first and foremost, and then the steps of reform will usually follow within due course of time. The World War with its results of thousands of maimed and crippled soldiers has recently brought the problem of the relationship of the cripple to his community before the public eye. The wave of sympathy which these war conditions have aroused has already done much—and will do more—to awaken the public to a realization of the problem and its social significance. The Division of Reconstruction of the Surgeon-General's Office has devoted untiring energy to the most scientific solving of the crippled soldier's problem; and thru its rapid strides in discovering new methods of aid, the civilian cripple as well as the soldier should benefit eventually. The reconstruction work includes invention of new types of artificial limbs and the testing out of trades and industries best adapted to the ability of disabled individuals. Mention has already been made of the Red Cross Institute for Cripples which was organized just before America entered the war, and which offers all its opportunities to civilians as well as soldiers.

With the movement of reconstruction and readjustment of cripples in general in the foreground of the public vision at present, the importance of the crippled children's situation should be emphasized and supported. There is a more optimistic side to the children's problem, because so many of their cases if given medical attention promptly can be avoided, or cured, or improved, whereas the adults have less natural chance of physical improvement. The Child Welfare Movement which is being introduced into every community in the country is a great asset in the movement to help crippled children. From an economic point of view, the arguments for

legislative provision for care of crippled children are overwhelming. The independence derived from education, vocational training, and adjustment to industrial life would lessen the burden of expense of the charity and relief agencies; would eliminate a large per cent of begging, and would improve the economic self-respect of communities. "A physical burden bravely borne makes a strong man whose moral force in a community is worth a score of mere men machines."¹ Crippled children have the same curious spiritual atmosphere of morale about them, which makes them appeal to the sympathies always; and the incentive to do constructive work to help their lot in life is the most worth-while product of sympathy. The old cry of "give the crippled children a fair chance" is the strongest appeal that can be voiced.

In this study of 150 crippled children, no startling discoveries of the problem have been brought to light. This study is rather an illustration and proof of the veracity of theories and assertions claimed by pioneers in this field. It has been said by many excellent theorists that the problem of crippled children includes the following fundamental facts: the greatest cause of deformities is disease; the mental capacity of a crippled child is normal and often above the average; the need for special schools and institutions is enormous; the medical examination and proper treatment of these cases results in communistic economy; the need for legislation to obtain social reform and adequate facilities for the care of cripples is overwhelming. These, and other underlying facts, have been claimed as the fundamental principles back of the problem; and this study has been an attempt to show from the social point of view that these facts are true. Statistics of actual estimates and specific illustrations bearing out statements are the most practical proof of scientific assertions, and such has been the purpose of this study. Its endeavor has been to contribute information which might be of some little value in helping to secure a normal adjustment to social and industrial environment for the crippled children of Indiana.

¹ *American Journal of Care for Cripples*, Vol. V, No. 2, p. 243.

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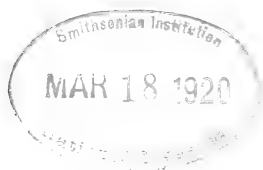
**THE SOCIAL ASPECT OF THE CARDIAC CASE: A STUDY
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*Submitted in partial fulfilment of the requirements for the degree
Master of Arts at Indiana University.*

Foreword

THIS thesis has been prepared under the direction of Miss Edna G. Henry, in partial fulfilment of the requirements for the degree of Master of Arts in the Social Service Department of Indiana University.

This opportunity is taken to express thanks to Miss Edna G. Henry, Director of the Social Service Department; to Dr. George S. Bond; and to the members of the Social Service Department for their interest and assistance in the preparation and completion of this thesis.

LELA FRANCES THOMPSON.

Indiana University, June, 1917.

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The Social Aspect of the Cardiac Case

By LELA FRANCES THOMPSON, A.M.

INTRODUCTION

THE Social Service Department of Indiana University began its work September 20, 1911. The Department has three objects¹: education, prevention, and research. It aims to further the cure of those patients referred to it by physicians in connection with the City Dispensary and the Robert W. Long Hospital who recognize that their patients need more than medicine. The patients are thus educated in personal hygiene and new ways of living. The education, however, does not stop here, for the community is taught thru the publications put out by the Department and the speeches made by the workers. Students, also, come in for their share of education, those studying medicine and nursing, as well as the ones enrolled in the Social Service Department.

Coöperation with the doctors was considered the best possible way to accomplish the results sought. Because of their medical connection, the worker was designated as the Medical Social Service Worker.

In the beginning there was only one worker, so the question naturally arose as to which type of case should receive the most attention. The patients dealt with were those who presented themselves at the City Dispensary and the Robert W. Long Hospital. All patients were unable to pay for care of any kind, so the one demanding the most in time and money would be taken as the one in greatest need of outside help. Some needed nothing but medicine, while others needed constant care and supervision as to work, recreation, diet, and general hygiene.

On October 4, 1911, the first cardiac case was referred to the Social Service Department by one of the doctors at the City Dispensary. The case was baffling. All kinds of social adjustments

¹ Report of Social Service Department of Indiana University, 1911-1912 and 1912-1913.

were necessary. From that day the Department decided that the cardiac case was one of its greatest concerns. Most doctors had realized this because of the failures with which they had met in trying to treat a case of this kind without aid in making social adjustments.

Within the life of the Department thirty-three doctors have referred cardiac patients to the social service worker for aid in carrying out the treatment prescribed. Due to the lack of time, all these cases were not followed as they would have been could more workers have been obtained. Because of this many of the patients have died. All of these patients could not have been saved, but most of them would have lived longer had adjustments to life been made.

Again, on the records are dates when the patient was admitted to the hospital for care, sent home improved, and then readmitted. When he came in the second or third time the same complaint was usually given. Had the hospital made a mistake by dismissing the patient too soon? Had the doctor failed in diagnosis? Had follow-up treatment been advised? Had it been understood? Was the community obliged to give so much free treatment to these few? Could they ever be made anything but patients? These questions all presented themselves and it was in an endeavor to find suitable answers and perhaps aid in the formulation of future plans that this study has been made.

An effort has been made to collect all the available material from statistics, studies made by other institutions, and records in this Department in order to ferret out all possible truths. Further study should be suggested by this material.

The State Board of Health probably in the future will collect more detailed statistics (than now exist) in connection with the deaths reported from cardiac disease in Indiana. In this regard it would be of value to know facts concerning: (1) homes touched by these deaths; (2) widows, widowers, and orphans; (3) average length of illness; (4) cost to the community of each case; (5) average length of time out of work; (6) occupations.

Those interested in the health of school children could contribute much to the argument for better care by examining and reporting the number of children of school age suffering from organic heart trouble.

If this study succeeds in arousing an interest along the line of better care for those suffering from or liable to cardiac trouble, it will have performed its duty.

I. GENERAL SITUATION

THE two words "physically handicapped" bring before the mind a long procession of people coming under the classification of "the lame, the halt, and the blind". In some communities, where there has been recent agitation, the tuberculous present themselves also. These are the spectacular, and it is that quality which catches the eye and stirs the sympathy. Within the last few years attention has been called to another group of as truly "physically handicapped". Their physical condition also renders them unable to compete with normal persons. This is that ever-increasing group of people who suffer from one or more of the so-called heart diseases.

Organic heart trouble, alone, has ranked first as a cause of death in Indiana for the past six years, with tuberculosis as a second cause. The third cause is chronic nephritis or Bright's disease. This often occurs as a complication with heart trouble. So taking Indiana alone, heart trouble, both organic and with its complications, ranks first and third as causes of death.

THREE GREATEST CAUSES OF DEATH IN INDIANA

Year	Organic Heart Trouble	Pulmonary Tuberculosis	Chronic Nephritis or Bright's Disease
1910.....	3,956	3,921	2,021
1911.....	3,972	3,588	2,210
1912.....	4,419	3,419	2,443
1913.....	3,998	3,446	2,533
1914.....	3,915	3,471	2,694
1915.....	4,214	3,444	2,787
Total.....	24,474	21,289	14,688

For the last four years heart trouble has been the greatest cause of death in New York City. For the last five years it has ranked first as a cause of death in the vital statistics of the United States. There has been a steady increase in the per cent of deaths from heart trouble from 1911 to 1915. In 1911 the per cent was 140.9 per 100,000, while in 1915 the per cent was 156.2 per 100,000.

TWO GREATEST CAUSES OF DEATH IN UNITED STATES

Year	Organic	Pulmonary
	Heart Trouble	Tuberculosis
1911.....	83,525	81,796
1912.....	86,179	75,429
1913.....	93,142	80,812
1914.....	93,588	84,366
1915.....	105,200	85,993

Statistics show numbers but not the human suffering which must be a resultant factor of sickness and death. In order to show the general situation in complete form, statistics should have been given to denote the number of homes affected by these deaths, the number of widowers and widows left, and the number of children remaining to face the world with one parent or perhaps both parents gone. Such studies have not as yet been published in connection with organic heart trouble.

Tuberculosis, upon the other hand, has been under discussion for so long now that very complete statistics can be found concerning it. As a result, such successful campaigns have been waged against this dread disease that its death toll was 25 per cent less in 1915 than it was in 1904.

Summary

From the facts shown here it can be seen that the cardiac patient is one of the greatest medico-social problems of the present day. More deaths are caused by this disease than by any one other, according to the statistics for the United States, Indiana, and New York City.

II. COST

Up to date there has been no widespread agitation nor information concerning heart disease. For that reason little has been thought of the expense incurred by the community for patients suffering from this disease. When the first break comes and the patient reports to the doctor for treatment he must remain idle for weeks. During this time some provision must be made for his family.

CASE MR. B. This last winter when prices of groceries were so high, one family was given two dollars' worth of groceries by the Charity Organization Society every other day for nine weeks. The man was out of work on account of his heart condition and the family had to be fed until he could return to some kind of a gainful occupation. After the long time of unemployment an attempt was made to obtain a light job for him. This was an almost impossible task for, as in many such cases, the man was uneducated and untrained. He had gone to school only three or four years and had had no occupational training. Finally a place was secured for him in a wood-working factory. Here he had to pile lumber, which was much too heavy for anyone in his condition. The constant lifting caused the heart so much extra work that another break was feared.

Besides being a great expense to the community, which supports all relief agencies, the employer of such a man must face the possibility of a collapse at work, which may cost him much. Even if accidents can be averted, it would not be very satisfactory to try to operate an establishment with "half men".

The family, too, often suffers from such an example in early life. The children learn to expect their employers to give them the easy job and the community to furnish support at any or all times. They thus become mere parasites on the next generation.

Another less tangible result of heart trouble, yet one that is an outgrowth of all idleness, is delinquency. This adds greatly to the general cost. As Chaucer has said, "Idleness is the gate of all harms. An idle man is like a house that hath no walls; the devils may enter on every side." The boy or girl, man or woman, who is told by the doctor to cease work, but is given no legitimate substitute, is sure to meet with many temptations that might help

to pass the time. This Department has been fortunate so far in not having to deal with many such cases, but this is a possibility that must be faced.

CASE MRS. P. If every patient had the adaptability of one foreign woman known to the Department, no alarm would ever be necessary because of idleness. She had been a hard working woman before her break when she was sent to the hospital. The four years on this side of the ocean had been spent in lifting heavy buckets in a meat packing establishment. She lay at the point of death for six weeks in the hospital, but finally started to grow better. Then she was taken to her home before the doctors thought it safe for her to go. She was told not to work. She did not spend her time thinking of how strong she once was, but took up crocheting. When the visitor asked her if she was careful and did not work, she cheerfully answered as she took a few more stitches, "This my work now, me do nothing else."

So far no account has been taken of the cost of visits made by patients to the dispensary or of stays in the hospital. According to the Report of Committees on Out-Patient Work for the Boston Dispensary, 30 dispensaries estimated the cost per visit from 10 cents to 75 cents. Taking the average, it may be said that each visit costs about 40 cents. This must be paid in some way. If the patient cannot pay, and the majority of patients are unable to pay even 10 cents, the community must pay. This it does either by appropriation or private donations. Considering the fact that some heart patients attend the dispensary at least twice a month for several years, what seemed to be little to start with soon amounts to a large sum. In case a home investigation is made, and it always should be made on a dispensary patient, the expense of the visit is added. The nurse who goes to give practical lessons in hygiene and the district doctor, who may be called at any time should the patient become critically ill, must be paid for their services.

Treatment in the hospital is more expensive yet for the time, but does not last so long. From the records of the 61 hospital patients dealt with by this Department, the shortest time spent in the hospital by any of them was 1 day and the longest 420 days. Talk of conservation of energy and money! Consider the fact that more than half of these patients would never have entered the hospital had there been more definite means of following them from the dispensary or even in their places of work

before they were forced to "lay off" and seek a doctor for the first time. Worse yet, some of these patients returned to the hospital two or three times. This was certainly due to one of two or three facts. First, the patient may have been discharged before he was really strong enough to leave. This does not often happen. Second, some have gone away from the hospital without a thoro understanding of how they should care for themselves. Third, the patient may have left the hospital facing a long period of convalescence. He had no convalescent home to which to go, so returned to unsympathetic or ignorant friends and relatives or to some necessary employment.

CASE M.S. A very good example of the second is the history of a young woman who has been in the hospital three times. She is well-meaning and ambitious. She lives with her brother and sister-in-law, who seem very good to her. She, however, does not wish to depend on them, so leaves home to work. A few days before the last break she was told by the doctor to go to bed and rest. She would not do this, so was brought to the hospital in a very weakened condition two weeks later. She seems perfectly willing to rest in the hospital at the expense of the community, but will not rest at the expense of her own family.

CASE I.C. Another patient has had hospital treatment the third time, because his family expects too much work of him. He left the hospital after the second long stay, feeling comparatively well. He went home with instructions to rest and regain his strength. There was a great amount of work to be done and the family seemed to think he should do his share. He tried and was brought back to the hospital in a more critical condition than ever. He said on entering the hospital last that he would just stay there now until he died. A table of the complete time spent in hospitals by these 61 patients may show more clearly the time cost to the community for their care.

COST TO COMMUNITY FOR HOSPITAL TREATMENT GIVEN 61
PATIENTS

Hospital	Number of Patients	Average Days	Total Days	Average Cost Per Day	Total Cost
City	15	58.8	882	\$1.30	\$1,146.60
Robert W. Long.....	46	63.6	2,925.6	2.20	6,436.32
Total					\$7,582.90

This shows that the City Hospital has spent \$1,146.60 for the treatment of 15 cardiac patients sent there, while the Robert W. Long Hospital has spent \$6,436.32 for 46 patients. All this money has not been lost. Some of the patients have recovered sufficiently to be able to return to the community in the form of work value received.

The money spent on some, however, has been lost, for the patients died while in the hospital or soon after leaving. Of the 15 cared for at the City Hospital 4 have died. The records show that 20 have died out of the 46 cared for at the Robert W. Long Hospital.

LOSS TO COMMUNITY THRU DEATH

Hospital	Number of Patients	Average Days	Total Days	Average Cost Per Day	Total Cost
City	4	92	368	\$1.30	\$ 478.40
Robert W. Long.....	20	65	1,300	2.20	2,860.00
Total					\$3,338.40

The average number of days spent in the hospital by those who die is greater than the general average. This shows that the expense is greater per patient for those who make no return to the community. This money, \$3,338.40, is a total loss.

Another way of looking at the loss to the community of deaths from heart disease is to count the money expended on the education of those who die before the productive age. Also the loss of production of those who die in the productive age of twenty-five to sixty.

DEATHS IN INDIANA FROM ORGANIC HEART DISEASE

BY AGES

Age	Deaths	Age	Deaths
1- 5.....	45	40-44.....	130
5- 9.....	29	45-49.....	169
10-14.....	32	50-54.....	255
15-19.....	27	55-59.....	310
20-24.....	53	60-64.....	445
25-29.....	49	65-69.....	544
30-34.....	67	70-79.....	684
35-39.....	87		

Considering the cost of education for the 141 who died from five to twenty-five at \$200 each, there is an expenditure of \$28,200

for which no return was made. Then take the potentiality of the 1,067 who died between the ages of twenty-five and sixty as having a money value of \$5,000 each, there is a loss of \$5,335,000. This shows a total loss of \$5,363,200 from deaths due to heart disease alone in the short space of twelve months' time.

LOSS FROM EDUCATION AND PRODUCTIVE POWER

Deaths	Ages	Average		Total Cost	Grand Total
		Cost of Education*	Average Produc- tive Power*		
141	5-25	\$200		\$28,200	
1,067	25-60		\$5,000	5,335,000	
					\$5,363,200

*Amount used in study made by State Board of Health on Tuberculosis.

When these figures were given no account was taken of the widowers, widows, and orphans, or homes broken up. It looks cold and heartless to put a money value on death, but it is often the most vivid way of presenting the truth.

It may be expected that figures for the entire state of Indiana would show some appalling truths, but statistics from the Department show also some very striking facts. Up to date there have been 154 definite cardiac cases reported to this Department. Out of this number, 45 have died. On the list are 23 men, 19 women, and 3 children.

The men constitute over 50 per cent of this total number of deaths, while the number of women is very little less. What home conditions have they left? The death of a child is sad, but it does not often cause the wreckage of a home and never the leaving of widowers, widows, and orphans, which means a certain amount of misery.

By the deaths of these 45 adults, 24 people were left widowed and 39 orphaned.

What is to be the future of these? Are they to be self-supporting and a help to the community or must they depend upon charity for a livelihood?

Again note these deaths by ages.

AGES OF FORTY-FIVE PATIENTS WHO DIED FROM CARDIAC TROUBLE

AGES	DEATHS
5-25.....	5
25-70.....	35
Unknown.....	5

The greatest number of deaths occurred in the productive age. Calculate the loss of money from education and lack of production on the same basis as before. On education for the 5 between five and twenty-five years the loss was \$1,000. The community lost also \$185,000 because the 35 died before they had given \$5,000 worth of work to their fellows.

If an estimate could be made of the real suffering caused to other members of the families and community by these deaths, the total would far exceed that already given in dollars and cents.

CASE N.Y. One patient in this number was a young mother with a luetic heart. This meant that her child and husband might be in danger of death from the same cause. The husband was ignorant of the fact until after her death. His mental agony cannot be imagined. He had to face his own future and that of the child. Did he give up to what seemed the inevitable or try to stem the tide and keep his head above the waves? It is not known, for he has dropped from the view of the Department.

CASE P.C. One young man was brought to the hospital for care and referred to the Department for aid in change of employment. He was just twenty-five and had started into a new profession. He was working in the advertising department of a newspaper. The position promised \$1,200 a year with a raise soon. He was pleasing his employer and enjoying the work when his heart gave way. He was in the hospital for many weeks. When he left, his condition was greatly improved, but he was unable to resume work for several months. He was young and ambitious, yet must face life with a handicap. He could never have the freedom he once had. His earning capacity was greatly lessened unless he sought new work that would not necessitate a strain on his heart.

CASE R. Another patient presented a parallel problem. This was a young woman with some education but little physical strength. For a number of years she had been one of the chief

telephone operators in the city. She started into this work when very young, so was unprepared for any other less strenuous position. Last winter she came to the hospital after a serious attack of tonsilitis, with a heart lesion. She was permitted to go home after a long period of treatment but warned not to do heavy or exciting work. She dared not return to her former position. She has attempted to do other tasks, but has not as yet succeeded in finding one that would give her a good income and not be too hard on her heart.

CASE D.H. One little boy, a hospital patient, had been educated in the grade schools. He had become greatly interested in engineering. While in the hospital he longed to study about engines and their construction. He died before he was able to accomplish any results in this field. Certainly one with such ambition would have been worth more to the community than \$5,000. It would be safer to multiply that by ten and agree with Lincoln that each child is worth \$50,000. This would then be the loss to the community by this one death.

Summary

The patient suffering from cardiac disease is often a great expense to the community in which he lives. If by any chance he has accumulated enough money to care for himself after the heart trouble appears he is at least not producing for the community. If, on the other hand, the patient has been unable to put aside enough money to tide him over a time of unemployment, the community must pay for his care and provide for those dependent upon him for a livelihood.

III. CAUSES

THE question naturally occurs, "Can heart disease be prevented?" The best way to answer that is to say that a certain proportion of heart disease can be prevented and still more can be arrested. To prove this statement it will be necessary to give some of the causes of heart disease, and show that had the cause been removed or properly handled the heart would have been in a better condition.

CLASSIFICATION OF HEART DISEASES ON THE BASIS OF THEIR CAUSE

Infections	Excitement
Overwork	Congenital malformation
Nervous strain	Alcohol and drugs
Lues	

The first is probably found more often in children, but many of the adult heart cases can be attributed to this antecedent history. Some of the diseases that children have which are not thought at all serious produce heart lesions.¹ According to one report on endocarditis in childhood, rheumatic fever is the main cause of heart trouble. The germ of this disease is supposed to enter the body thru tonsils, adenoids, or bad teeth. At one time it was thought that a tonsillectomy was the cure-all for chorea, which is all too often accompanied by heart trouble. This has been disproved, as is shown by a table taken from the pamphlet mentioned above.

The results² obtained from the study of a number of children in regard to tonsillectomy and chorea showed that (1) 12 cases had chorea after tonsils were removed; (2) 9 cases had chorea before tonsils were removed; (3) 8 cases had chorea before and after tonsils were removed; (4) 4 cases had chorea after, but not before; (5) 1 case had chorea before, but not after.

CASE H.H. One little girl has had chorea and heart trouble for some time. When she was first noticed she was a very nervous girl, coming to the Dispensary. Her nervousness was diagnosed

¹ Symposium on Endocarditis in Childhood. In *Boston Medical and Surgical Journal*, September 2, 1915.

²*Ibid.*

as chorea and she was treated for that. Later it was found that she could not stand much exertion and she was taken out of school. Hospital treatment was prescribed and it was while in the hospital that the heart involvement was noted. Treatment for this was started and after three years she was sent back to school. Her heart trouble has been arrested and unless unlooked-for trouble comes up in the future, she probably will be very comfortable when grown.

CASE O.S. A patient entered the hospital this year with tonsillitis. She had been doing indoor work, as telephone operator, and intended to return to that occupation as soon as possible. It was learned while she was still in the hospital that she had a serious heart lesion. A tonsillectomy was necessary, but the damage to the heart had been done. She left the hospital very much improved, but she will always have to be careful not to overwork her heart in any way.

CASE C.M. This is a bright, attractive girl of about fourteen. She lives with her widowed mother, grandfather, and small brother. For a number of years the mother has had the responsibility of the family from a financial standpoint. She was, therefore, forced to work in a store and leave the little girl to do the housework and go to school. The child has nephritis with concomitant infectious heart complication. Her trouble seemed to follow diphtheria. By one period of treatment in the hospital and constant care and observation, she has been kept in school. If the nephritis can be checked or cured and the heart protected from further infection, the child may live many years. Her mother thinks she will die within three or four years at the most, for "a cousin of theirs died when eighteen".

CASE G.Z. A little ward of the Orphans' Home was watched by the Home doctor for some time. It was noted that she constantly had sore throat and was not strong enough to play with the other children for long at a time. Some treatment was prescribed but not carried out, so she was brought to the hospital. The doctors in the hospital found that she had heart trouble, probably due to some infection. Perhaps it was the same infection that was causing the sore throat. She was treated for some time and then returned to the Home with instructions as to her future care. After about a year she was examined again and her

heart was found to be in a good state of compensation. Her life can be practically that of a normal child so long as no new trouble arises.

CASE E.B. This winter a man was brought to the dispensary by the Charity Organization Society. He could not work on account of his heart condition and the family was dependent on charity for support. The man was given a thoro physical examination, advised to have his teeth all pulled, and then return to work. At first this looked rather far-fetched, but when it was learned that pyorrhea was the infection probably causing the heart trouble, it could be seen that to stop the source of infection would help. Family conditions were such that he could not have the teeth removed at once, but in the course of time this was done. He has been at work now for several weeks and is making enough to support his family. He is not able to do as much as he once could, for the heart has received a permanent injury that must always be considered. The chances are that if no new infection starts, he can care for his family in the future by being careful. Had the cause of this trouble not been stopped, several of the family might have suffered the same. As it is, one of the children is very frail, but his trouble has not been diagnosed.

CASE MRS. D. A similar case was that of an old woman, who found her way to the hospital last winter. She had a bad heart condition. Her teeth had been removed a few weeks before. She was also suffering from stomach trouble. She was treated for some time and then returned home with careful directions as to diet. She followed these and was soon able to assist with the housework. A set of false teeth has been given her, and unless some new trouble starts, her old age may be very comfortable. She has very little income, but does not worry about it. Her disease probably was the result of long-standing infection, but her natural resistance had saved her up to that time.

The luetic heart, or that condition caused by venereal disease, is of course a certain kind of infection, but is discussed separately because it is almost a certain outcome of this disease if it remains unchecked. When it is found that a patient has syphilis, heart trouble is looked for. It is not always present at first, but may appear later. One great calamity following this disease is the malformation of the heart often found in children of such parents.

CASE E.H. One patient has had heart trouble for a number of years. The cause of her condition was unknown until it developed that at least two of her children had heart trouble. One little boy has a definite congenital malformation of the heart, but the nature of the baby's heart trouble is not known as yet. So far all blood tests for syphilis have been negative, and the character of the family would argue against the disease. The doctor, however, knowing the history, feels sure that it is a luetic infection which may have been inherited.

CASE MRS. L. This woman came to the dispensary some years ago complaining of shortness of breath and nose trouble. She had always lived a moral life and could scarcely believe it possible that syphilis could be at the bottom of all her trouble. She has now completed her third year of anti-luetic treatment and her old troubles have disappeared. Her shortness of breath was due to heart trouble and probably some asthma. This was a case of inherited syphilis, perhaps.

CASE MRS. R. A feeble-minded syphilitic woman was another heart patient referred to the Department for aid in care. She has been one of the most trying of all the patients. She was difficult to handle because of the feeble-mindedness. She refused to be treated, so no progress was possible. She has been unable to do hard work for some time. Her own life and the lives of all about her are made miserable because she will not be helped.

CASE MRS. M. This patient was referred because of her luetic and heart condition. She has been able to live with little discomfort from the weakened heart by being careful. She had not been in the dispensary for some time until about two months ago. She had done some extra work then and was not feeling so well. Soon after that she had to be taken to the hospital for another course of treatment. Here, as in the other cases, the heart condition would be improved could the infection be cured or checked.

There is some heart trouble attributed to alcohol and drugs. In these cases there is probably a gradual degeneration of the organ. As would be imagined, these are very difficult to handle. The habit must be broken and then treatment given. Any man or woman who has heart trouble from alcohol or drugs is going to argue a long time before confessing to the habit.

CASE W.R. One man has been referred to the Department whose heart trouble might be attributed to alcohol. He was suffering from alcoholic neuritis with a heart complication.

CASE F.P. This woman was addicted to the use of morphine. She was suffering from nerve trouble with a heart complication. The Department worked with her for some time, but little could be done. Could she have had institutional treatment, some results might have been obtained. The doctors ordered the drug kept from her, but who was able to comply? In fact, she came here from another city in order to obtain morphine more easily. These cases may have been cardiac trouble from other causes associated with alcohol or drug habit.

Overwork sometimes indirectly causes heart trouble. No patient has ever been referred with this alone as a diagnosis, but from the nature of the work done by some this is probably a contributing cause in many cases.

CASE MR. N. This man has always done heavy work. Heavy lifting has been his lot for the most part. Most of his time has been spent with a lumber company where he piled the heavy planks. Whenever an attempt was made to change his work, his lack of training thwarted all plans. It is sometimes thought best to "stick to" a certain type of work when once started, but it is much better to be a "jack-of-all-trades" when you have a weak heart. Overwork may not be the cause of this man's condition, but it certainly is much against his recovery.

Excitement and nervousness are often considered causes of heart trouble, but more often only produce symptoms.

CASE I.W. One patient had a slight heart trouble. The doctor did not know the man's temperament, so mentioned his condition to him. From that time on that patient had visions of dropping dead any time and any place. He was afraid to do hard work of any kind because "people with heart trouble should be careful." This Department added fuel to the fire by sending a visitor to call on him. He thought then his condition was serious. No doubt the man suffered much from this fear, but his nervous, excitable disposition prevented him from understanding any explanation that might be made. When he was visited last he was clerk at a soda fountain and complaining that the work was too hard.

Summary

Cardiac disease may almost be said to be a biproduct of some other disease in every instance. Protect the patient from the primary disease and the heart will not be injured further. Subsequent management can control the strain placed upon the damaged heart so as to prevent the possible cardiac failures.

IV. MEDICAL AND SOCIAL TREATMENT

THE treatment for cardiac trouble, like the treatment for many other diseases, has undergone a marked change within the past few years. Long ago doctors were taught to treat symptoms rather than to probe deeper for causes. They could rely upon little, therefore, in the way of treatment. The drug most used then for cardiac disease, as today, was digitalis. When a patient entered a doctor's office and it was found that his heart was not doing all the work required of it, this drug or one with similar action was given at once. Often the heart was having to supply blood under very adverse circumstances. After the drug was given the heart would start anew to pound away and try to perform its illegitimate work. In case this was not successful or the case presented a need for other treatment, such as an over-supply of blood, bleeding was resorted to. This was considered very effective by some because of the quick relief given to the patient. This is used now to meet emergencies. To be sure, there was usually, if not always, a reaction, but this was not always taken into account. The patient, after the loss of a large or small amount of blood, was left in a weakened condition so that cessation from his normal life was imperative. It is known now that the rest thus obtained was probably the true cause of improvement.

Since the advent of preventive medicine, there has been a marked change in thought concerning the cardiac case. The present applied treatment is divided into three main groups: (1) treatment of cardiac children; (2) treatment of adults; (3) convalescent care.

The first type of treatment has been taken up in more detail perhaps by the Massachusetts General Hospital in Boston than by any other institution. The children with heart disease who came to the clinic at this hospital presented such a great field that the time of one medical social service worker has been mostly taken up by their care. The doctor attempts to find the condition of the heart and the cause of the trouble. He then asks for after-care. This task is usually turned over to the social service worker. This is provided for as far as possible with the patient's family within the home. When the parents of the child, however,

cannot be made to see that rest in bed is necessary, in spite of the fact that the child is neither suffering pain nor is "sick at the stomach", an attempt is made to secure the very necessary rest, fresh air, and wholesome food elsewhere.

As soon as the child's heart is able to compensate to even a slight degree, exercise is allowed under strict supervision. When complete compensation is established the child is allowed to return to normal life, but always must be watched. This is necessary, for sometimes even a few minutes of overwork or too hard play will cause a break in compensation, and the entire process of rest and after-care must be repeated. In this Department's study of the cardiac case, the need for some home in which the children could be cared for during the period of convalescence after leaving the hospital has been felt.

CASE H. In one case, a little girl about ten years old with a complication of chorea and heart trouble, the mother was told to keep the child in bed; give her plenty of good, nourishing food; allow her to sleep in a room by herself with plenty of fresh air. Were these directions followed? There was no apparent reason why they should not have been. The mother seemed devoted to her children. She could understand what was said to her, and was so situated that the directions could have been carried out without any unbearable hardship. A visitor who followed the case called one day soon after treatment was started. Before she reached the home she met her patient on the sidewalk on roller skates. She talked to the mother in the home and learned that the child was sleeping in the family sitting-room by the stove with no outside air in the room. This arrangement forced the child to stay up until all the family had retired. She was then in the habit of reading a long time after going to bed. To some this may seem to be a personal matter, but when it is known that the child was staying out of school because of this cardiac and chorea trouble, it takes on a more serious appearance. Could convalescent care have been provided out of the home, the problem would not have been so difficult.

CASE W.B. Another patient, a little boy of about the same age, was brought to the dispensary. His heart and nerves were in a very bad condition, but he did not have chorea. The doctor advised as to treatment and referred him to the Department for following. His aunt, with whom he lived, was told how to care

for him. She was very much interested in the child, and also was bright enough to know that rest meant just that. He has been in school every year, and upon last examination his heart was in a good state of compensation. To be sure, this shows the difference in the people to whose care the children were subjected, and so long as we deal with children their home conditions must be taken into consideration and met.

CASE M.C. Some of the patients have obtained much benefit from short stays at homes of intelligent and interested relatives and friends. "M. C." needed a change very badly. Her mother was unable to send her away from home, or, in fact, to do anything that would have meant an extra expenditure of money. Her relatives were written to and the situation explained. The grandmother was found to be greatly concerned about the child and willing to do anything possible for her. Arrangements were quickly made and the child sent to the home of the grandmother for convalescent care. The doctor wrote out very detailed directions as to diet and care for the grandmother to follow. When the child was returned to her home she was in a very much better physical condition. Since that time she has never returned to the hospital nor been sick enough to miss more than a few days of school at a time.

CASE MRS. E. Some patients have been sent on vacation trips to the country or summer camps. One woman took her family of little children with her one summer, and spent several weeks at a summer camp. The little boy, who was sick, was greatly benefited by the life in the open air. He was unable to take an active part in the outdoor games, but the rest and fresh air did him the good he needed.

It has been said that there is more done for sick or friendless children than for any other dependent class. This is because of the readiness of everyone to respond to the childish appeal. When an attempt is made to obtain help for older people less appealing to sympathy, the task is difficult. This has especially been found true in work with the adult cardiac case. As a usual thing a man with a very weak heart, even one in such a poor state of compensation that walking one block causes such a shortness of breath that he must stop to rest, does not attract the notice of the bystander. The man stops, looks in a show window for some time to hide the fact that he is resting, but shows no outward signs of

suffering to the outsider. Yet by a little extra exertion this man would be forced to the hospital or even death. Some attempts have been made to catch this man before the final break in compensation, and by careful treatment to give him a chance to return to society and to live a fairly normal life.

The Bellevue Hospital is the pioneer in organized work along this line. After a few weeks' treatment in the wards of the hospital, adult patients, as many as possible, are taken to a convalescent home for further rest and care. One of the sad things in connection with these patients is the fact that the occupation nearly always has to be changed. Nine times out of ten the work that the patient has been doing has contributed largely, if not wholly, to his breakdown. He, therefore, cannot return to it. This necessitates an effort, on the part of the individual and helpers, to find some suitable occupation. In connection with Sharon, the convalescent home to which Bellevue sends her patients, a trade school has been established. A great number of experiments were performed before any type of work was found that was suitable for all, and yet had a commercial value. At last it was decided that the making of cement flower pots came most nearly to filling all the requirements. The patient taken here is taught this work during his period of convalescence. After he is dismissed an attempt is made to use him in the shop or find him similar employment.

In connection with the out-patient department at Bellevue, evening classes have been started for cardiac men and women. The work is given in the evening so the patients who are employed during the day will not have to lose time and money by attending. Patients come here and willingly wait until eleven o'clock for their turn to see the doctor. They are advised as to their work and recreation. In addition to this they are encouraged. Often-times only a suggestion is needed to give the patient an idea of the kind of work he can do and still live in physical comfort.

CASE H.E. Most of the patients brought to this Department change their own work or manage in some way to do less of the same kind of work. A woman came to the Department three years ago with a very bad heart condition. She was doing the house work, washing, and all for her family, which consisted of her husband, two children of her own, and one adopted. She was told not to do the family washing any longer and that she

probably would never live should she have another child. She now has a baby less than a year old, and with the exception of the laundry is able to manage her own household affairs. An interested person furnishes the money for the laundry. About a month ago the patient thought she would use the money given her for a waist which the older boy needed and do the work herself. At a result she was in bed one week. She now knows her limitations and understands the necessity of being careful. A suggestion driven home by bitter experience was needed here.

CASE MR. C. In the course of treatment the recreation must be watched as well as the work. Mr. C. left the hospital in a very good condition. He was warned against overwork of any kind. He obeyed the orders literally and was doing well. One day he decided to visit a sister who lived about three miles away. The day was nice, so why not walk? He walked to his sister's and then rode to the hospital for another course of treatment.

In all cases it is the doctor's business to find the trouble and then prescribe the treatment. It is then the duty of the patient to carry out directions. Here is where the service of the social worker is called for. If the heart is in an acute state, immediate rest is ordered, with proper diet. How is a man to go home and go to bed, put in his order for oranges when there is no one in the family to earn money for even bread to eat? An outsider can usually help here.

CASE MR. E. One family was of a very independent nature and did not like to "live on charity". They were forced, however, to let the Charity Organization Society care for them one winter while the bread-winner was regaining his health. Because of their disposition, no injury was done the family, for they could not be pauperized.

CASE H.N. In other cases different members of the family have been urged to go to work and provide the living until the wage-earner could become strong. He was thus given a chance to follow the doctor's directions and regain a strong heart. One patient was in the hospital for several weeks. His wife understood the situation, so went to work in a box factory to earn the living. After he left the hospital she continued her work and gave him a chance to recover. All that was necessary in this case was someone to make the suggestions.

CASE MR. M. This man presented quite a different problem so far as obtaining rest was concerned. He was taken to the hospital for treatment. He was gaining gradually, but his mind was not at ease. His wife could not, or would not, realize that he was a sick man. She rebelled at the idea of getting along on a reduced income. He worried over these conditions until he could stand it no longer and then left the hospital against the doctor's wishes, to return to work. He is now doing heavy work, and the doctor predicts a serious break in the next few years, if some other plans are not made.

Nor do men have all the difficulty in following the doctor's orders to rest. The woman with a home to keep up and several small children to care for has an equally hard task. Rest means absolute relief from work and exercise. Sometimes the children must be boarded out with friends or relatives in order to carry out directions. Again, a neighbor may be hired to care for the children. In fact, all kinds of shifts have to be made.

When the treatment is given in a hospital the task is different but difficult. It means much for a woman to consent to leave her husband and children for an indefinite length of time.

CASE MRS. A. This woman was told one day that hospital care was all that would benefit her. An ambulance was called and she was taken to the City Hospital. Her husband took the baby there to see her and then took it to the home of his parents to be cared for until the mother was well. That has been over two years and the baby is still with the grandparents. The mother has recovered to a certain extent, but it has never seemed best to change the existing plans. Rest in this case caused the family ties to be severed. What is still more to be regretted, the family has slumped into a state of almost total dependence and near-pauperism.

CASE MRS. W. A poor widow was told to go to the hospital for the second time. She was grief-stricken and considered it an impossibility. Was it because she had a dread of the hospital? Had she been ill treated before? Were there small children needing her care? None of these. Her grief was caused by a grown son. When she was in the hospital before this son had fallen into bad company, and she feared the same would happen again. The social worker finally waived this objection and she took the needed treatment. She is now very well and happy.

CASE MRS. H. This woman has had heart trouble for several years. Every few months rest is necessary. Hospital care has not been necessary here, for the needed care has usually been arranged for in the home or with friends and relatives. Twice within a few years she has taken her children and gone to another state to visit relatives until she could regain strength. She is intelligent enough to know that she must care for herself if she wishes to rear her family of children.

In all these cases the patient is first told about his condition. Yes, really told that he has heart trouble, but also informed that it is not the dire and dreaded calamity it was once thought to be. As Dr. Cabot has said, there is a difference between "telling the truth and conveying the truth". If he were told that his heart was diseased and nothing else to give hope for the future, what benefit could be derived from treatment? Every possible aid is given to make his adjustment to life easier. He is shown that he must face the world with a handicap just as the victim of a wreck must face the world with but one arm. After the complete understanding has been established and treatment started, the future must be planned for.

Treatment does not end with getting the patient out of bed. It must go on into the future occupation, recreation, and home life.

A child usually presents a very difficult problem because the family must be educated before the patient can be handled. It is often hard to get the mother to see that "minding the baby" can be just as injurious to the child as work to the grown-up.

CASE R. One little girl was taken safely thru the hospital treatment and period of convalescence. She had been out of school for some time, but had arrived at the place where school work would not be injurious. Plans were made for her to enter school and, if possible, to obtain enough education to serve her when she tried to obtain work suitable for a cardiac patient. Every time she was visited she was found taking care of a sister's baby, but the mother contended she was not able to go to school. No results have been obtained because the mother cannot see that the girl has a future that should be planned for.

CASE S. The mother of this girl understands that her daughter will not be able to do heavy work in the future. She has had a very hard time in a financial way, but always has managed

to keep the child in school. When the time comes for the child to earn a living, there will be some hope that easy work can be obtained. By "easy work" it must be understood that work suitable for a cardiac is meant. This excludes heavy lifting, walking long distances, being on the feet long at a time, and any work with much nervous strain.

CASE MR. K. This man had been doing heavy work in a lumber mill. The work kept him in a close, dusty room. A change of employment was imperative, even after he had taken a long course of treatment. His training was very limited, so but few positions were open. He tried for some time to get someone to try him. When the future looked about as black as possible, a place was offered him which really looked good. He was to work at night for an ice cream factory. All that was required was that he be there to care for the horses when they were brought in by the drivers from the various routes. The doctor was consulted. He reported that the dust from the horses would be about as hard on the patient as the lifting. At last his former employer offered him a place as foreman in the lumber yard. This was as good as could be hoped for, so it was accepted.

CASE MRS. O. In the case of the housewife it is often sufficient to get the washing or sweeping done for her. As one doctor said, "Sweeping does not look hard, but few women with heart trouble can stand much of it." One patient has been much better ever since a friendly woman provided for the washing to be done away from the home.

CASE S.M. The school child must also be cared for as she returns to normal life after an attack of heart trouble. She may have recovered apparently, but a slight neglect might cause a relapse. One girl was found to be eating cold, unwholesome lunches at noon. She went home at noon and prepared lunch for herself and small brother. She did not have time to cook anything, so usually bought pickles, cake, and prepared meats of some kind at the corner grocery. Her diet had been watched very carefully during the time she was in the hospital, and was one of the most important items of treatment. Some might say that the mother was responsible for her care, but she did well to keep the children clothed and a home to live in. She was a widow and had no income except what she made by working in a shop. It, therefore, fell to the lot of the social service worker to

help arrange for a different sort of diet for the child. A neighbor was engaged to give the warm noon lunch and an organization of the city was to bear the expense. This worked for a time, but before long the girl felt that she should not be getting so much unless the same was given to her brother. The plan then had to be dropped. By this time, however, she seemed to realize that she must be careful of her diet, so there has been no trouble of that sort within the last year.

The children are always instructed about playing too hard or running until they are short of breath. Sometimes it has been necessary to have the gymnasium work in the school left off entirely or at least cut down. The teachers are found usually to be very reasonable in all cases where the request is made thru a doctor or this Department.

There is another phase of treatment that must follow or accompany the treatment for the cardiac condition. This has been referred to in the chapter on Causes but may be mentioned again here. That is the treatment of the primary disease or disease causing the cardiac trouble.

CASE T.W. One girl was brought to the dispensary with a very pronounced goiter. The doctor there feared a heart complication, so had her examined at the hospital by the use of the electro-cardiograph. She was found to have a very weak heart. From now on treatment at the dispensary will be guided by that knowledge. Had it been found that there was no cardiac involvement, an operation might have been turned to at once with no fear of the outcome so far as the heart was concerned. The heart will never be as strong as it should be so long as the goiter is unchecked, but by rest and care it may become strong enough to withstand the shock resulting from the goiter treatment.

It is often very difficult to determine the disease causing the cardiac condition. On a few record cards nothing is found under diagnosis save the heart condition. On others such statements as the following are found: "heart trouble following grippe", "cardiac condition, nephritis, following diphtheria", "pyorrhea, heart trouble", "endocarditis, lues". The fact that no disease causes the same heart condition in two patients makes it impossible to say which disease is the cause in any one case. If lues always caused one kind of heart lesion and pyorrhea another, it would be much easier to prescribe treatment.

The last thing to be done in the treatment of the patient is

to teach him to care for himself. Some may say this should come first, but it cannot be done with good results until later. When he first presents himself for treatment he is usually in such a weakened condition that all the care must come from the outside. He should be taught to care for himself before he is dropped, so as to prevent a return to the former condition.

He should be trained in some of the fundamental rules of hygiene. He should be taught to eat nourishing food in small quantities rather than large amounts of the cheap material that has little or no food value. He must learn to avoid infectious diseases, but if they are contracted to have them treated at once. Above all, he must know his limitations and not exceed them. When the public once sees the need of training people to keep themselves well, as the Chinese hire their doctors to do for them, such training as the above will be put in the factories and places of work as well as in the schools.

When all possible has been done with the individual patient, his family must be educated. This has been mentioned above. The home conditions must be studied and changed, if necessary, to suit the welfare of the sick one. If it is found that the patient is sleeping on the second floor in a closed room when he should have no steps to climb and have plenty of fresh air, this question must be taken up with the family. Shifts of one kind or another can usually be made if the family is made to see the necessity of such. Again, if cheap food is given to the patient who should have a condensed diet, arrangements to suit this requirement must be made. In some such cases, it has been necessary to call in the aid of one of the relief agencies and have the food furnished.

The hardest families to educate are the foreigners who cannot understand our language, and the selfish ones who do not see the need of sacrificing for the sick member.

CASE MR. S. One foreign man came to the dispensary with a very serious heart condition. He was told to stop work for a time and be very careful of his diet. The Charity Organization Society was called upon to furnish provisions for the family. This was done, but after a time the patient became dissatisfied with the groceries given and was determined to return to work. By going back to work he was forced to cease treatment. If he could have understood why it was necessary for him to follow directions, he probably would have helped to carry out the plans made for him.

CASE MR. C. The selfish family will not be educated. One patient had all hopes of recovery if his family could be made to see that he was unable to provide for them for a time. He attempted to follow the doctor's directions and not go back to work. The result was that his wife soon had him brought into court for nonsupport. She was told time and again that rest was the only means by which her husband could regain his health, but to no avail.

CASE R.E. Some cases have been very easy to educate. The mother of this little boy was told by the doctor that he had a serious heart malformation and should always be cared for very carefully. He was not allowed to run, walk any distance, play much, or go to school. The mother saw the necessity of following all these directions after they were explained to her and has done the best she could.

The employer and school teacher often come in for their share of education. In many cases if the employer is told that one of his employees is doing too heavy work, he will shift him to an easier place.

CASE B.E. This man had proved himself to be a good, honest workman. The time came when he was unable to stand the heavy lifting in a dusty room on account of his heart. He even had to give up his work altogether for a time. The employer was told that he could no longer do the hard task. As soon as possible this employer offered him a position as foreman. Here he did not have to endanger his very life in an attempt to make a living for his family.

CASE X. The teacher is usually very reasonable when an appeal is made to her in a pupil's behalf. In one case the teacher really deserves most of the credit for the pupil's improvement. She watched the child very closely while she was in school and was always anxious to do whatever was for the best. When it was suggested that this child should not have to go to the third floor in the school building, the teacher readily had arrangements made whereby the child was transferred to second. In every case it is the kind-hearted, far-seeing, intelligent person that is able to grasp the meaning of care as a means of prevention from future ills.

Summary

The treatment for cardiac trouble consists mainly in following the doctor's directions as to rest and diet. After compensation is established, the work, recreation, and habits of life must constantly be supervised by a competent physician to prevent relapse.

The patient, his family, and employer must all be educated to the place where they see that there are certain rules that must be followed if the patient is to live.

In the case of a school child the interest of the teacher should be aroused in order to protect it from injury while under her care.

V. STATISTICS ON PATIENTS

Up to date there have been 154 cardiac cases referred to this Department. Some of them represent several years of close following, while others were never seen after the first time. The Department is still following 55 of these. Each active case presents a different problem, but all need help in some way.

The question naturally arises as to what has happened to the other 99. Of this number 45 have died, and 32 are lost, or at least it appears so, for the Department has been unable to locate that number. Of this number there are some dispensary patients that never even returned to the dispensary for treatment. When an effort was made to locate them they had moved from the address given, sometimes into another town or state. Of the patients, 4 have recovered from the temporary misfortune that forced them to ask for public medical and social service, and are going to private doctors. This number would probably be larger could some of the so-called "lost ones" be heard from. There are 3 in institutions such as the Orphans' Home and School for Feeble-Minded Youth. These institutions furnish medical care for all who are sent there, so the Department has no further responsibility so long as the patients remain there. There are 3 under the care of other organizations, such as the Flower Mission and Children's Aid Association. Eleven have been "dropped". This sounds rather cruel, but in every case there has been a good reason for discontinuing care. Sometimes all has been done for the patient that can be done. Again, some patients have learned to care for themselves, so need no outside help. A few patients have absolutely refused to respond to treatment and only caused trouble if an effort was made to help. As one worker said in response to an inquiry about visiting a certain patient, "Let a sleeping lion rest."

CARDIAC PATIENTS REPORTED TO THIS DEPARTMENT

Number under care.....	55
Dead	45
Lost	32
Dropped	11
In institutions	4
Going to private doctors.....	4
Cared for by other organizations.....	3

Total 154

Statistics gathered from the cardiac patients who are still living show some very interesting facts. The question often arises as to whether the care of any physically handicapped is a city or state problem. The cases are usually discovered in the city, so are unloaded on the city for care, but where did they come from originally? Many patients referred to this Department have been brought up in the small town or country. They have appeared in the dispensary and because they came from places of work in the city, the city was forced to give them treatment regardless of their birthplace. Many that came to the Robert W. Long Hospital for care came from the country or small town and returned there after being dismissed. Those who entered the City Hospital for care have had a record similar to the dispensary patients. Some patients due to the stress of city life have drifted back to the smaller town, but this has been rare.

CASE W. One patient has left the city to go to a smaller town within the last year. He has been gone only a few months, so may return.

CASE C.T. Another has at different times gone to the smaller towns, but is at present back in the city accepting the free medical treatment offered here. Some were found who did not know the place of their birth. They were members of those constantly moving families. Definite information concerning place of birth was obtained from 70 of the 99 cardiac patients reported to the Department that are living.

PLACES OF BIRTH OF SEVENTY CARDIAC PATIENTS

City	17
Small town	19
Country	19
Unknown	15
<hr/>	
Total	70

If the 38 born in the small town and country could be cared for by their own community or the state at large, the problem of the city would be about one-third what it is at present. If these facts were more generally known, the "stress of city life" would not be given the credit for so many breakdowns.

The statement has been made by the Department of Health, of the City of New York, that there are now not less than 20,000

children in the public schools of that city that already have permanently damaged hearts. If this be true for New York City, a like condition must exist in other cities. According to the age of patients referred to this Department, the percentage of children is very small.

AGES OF SEVENTY CARDIAC PATIENTS

Ages	Number of Patients	Ages	Number of Patients
1-10.....	5	45-55.....	13
10-15.....	8	55-65.....	6
15-25.....	8	65-75.....	5
25-35.....	12	75-85.....	1
35-45.....	12		—
Total			70

This shows that the greatest number of people suffering from heart trouble are between the ages of twenty-five and fifty-five. This is just the time of life when a person should be at his very best physically. This shows also that the number of children sent to the Department is not so great as should be. This probably is due to the fact that little attention has been given to the heart trouble of school children either by the school doctors or school nurses. Just so soon as the magnitude of this problem is made public, active preventive work will no doubt be started.

The number of men and women who suffer from heart trouble is very nearly the same. This table shows that they are equally susceptible:

PATIENTS, ADULTS AND CHILDREN, LIVING

Men	38
Women	39
Children	22
	—
Total	99 ¹

The social status of these patients is also of interest. Some think that those who live the unnatural life of a boarder or those who have suffered the calamities that lead to the divorced or widowed class are more prone to heart trouble. The following

¹ The information concerning sex and approximate age could be obtained when the exact age was not known. This accounts for the discrepancy in the last two tables.

figures will show that this has not been proved true in the patients referred to this Department:

SOCIAL STATUS OF NINETY-FIVE PATIENTS

<i>Single</i>	
Male	12
Female	17
<i>Married</i>	
Male	24
Female	21
<i>Widowed</i>	
Male	3
Female	14
<i>Divorced</i>	
Male	2
Female	2

The children have been counted in the "single" class, so there are probably very few single adults known to the Department. Again, this shows that the greatest number suffering from heart disease are those upon whom others are dependent.

It has been said that the hospital or dispensary treatment usually has to be followed by change of employment or adjustment to life. A glimpse at the occupations of 72 patients referred to this Department will show why this is true. Information was not always obtainable concerning occupations.

OCCUPATIONS OF MEN

Occupation	Number	Occupation	Number
Laborer	10	Janitor	1
Farm laborer	6	Railroader	1
Painter	3	U. S. mail service.....	1
Electroplater	1	Barber	1
Fireman	1	Butcher	1
Junk dealer	1	Coach builder	1
Gardener	1	Watchman	1
Peddler	1	Minister	1
Blacksmith	1	Carpenter	1
Paint mixer	1	Teamster	1
Presser	1	Team foreman	1
Machinist	1	Engineer	1
Millwright	1		

OCCUPATIONS OF WOMEN

Housewife	16	Mending	1
Housekeeper	5	Seamstress	1
Boarders	3	Teacher	1
Factory	2		
Clerk	1	Total	72
Telephone operator	1		

A distinction has been made between housewife and housekeeper. Housewife has been taken to mean the woman who works in her own home for her own family. Housekeeper has been construed as one who keeps house for someone other than her own family. The information as to occupations of women is very meager, probably due to the fact that it is often taken as a matter of course that a married woman is always a housewife.

OCCUPATIONS OF CHILDREN

School	14
Clerk	1
At home	1
Candy factory	1

From this it can be seen that all the work done by the adults is hard physical labor. The field of work for the unskilled has been very nearly covered by this table, but every occupation mentioned has proved unsuitable for the cardiac condition of at least one individual. Some may take up the work under these headings and improve in physical strength, but they must be watched carefully. For example, if one patient has broken under the stress of farm labor, he might thrive in a position as teamster.

Before leaving the study of these patients referred to the Social Service Department who are still living, it might be well to see how much the community has spent on them in order to save their lives. These patients have been restored to a certain degree of health and are partially filling their places in the scheme of life. For this reason the money spent for hospital treatment has not been counted as a loss as it was in case of death in Chapter II.

PATIENTS RECEIVING HOSPITAL TREATMENT

Hospital	Number of Patients	Average Number of Days	Total Days	Cost Per Day	Total Cost
City	11	46.7	514	\$1.30	\$668.20
Robert W. Long.....	26	62.5	1,625.6	2.20	3,576.32
Total					\$4,244.52

If these patients follow directions now and do not become dependents, the money will have been well spent, but this is not certain as yet.

Summary

The facts recorded in this chapter show some very startling truths. The majority of cardiac patients reported to this Department have been born in the small town or country, and are, therefore, not rightfully the problem of the city.

The large majority of patients suffering from cardiac disease are in the productive age. Most of them, also, are married and therefore have dependents.

All occupations known to have been engaged in by these patients represent hard physical labor, this making it imperative for some change to be made before complete recovery could be hoped for.

CONCLUSION

IF what Shakespeare said, "a good heart is worth gold", be true, along what lines is work to be done in the future to keep the heart in as good physical condition as possible? No one doctor can undertake the task, nor can one hospital do it. There must first be an awakening to the need and then a systematic fight waged. All doctors giving free medical aid should coöperate. They should not be satisfied to treat an infectious disease and pay little or no attention to the endangered heart.

Mothers with little children should be warned against taking a weakly child where it may catch some infectious disease. After such a disease has been contracted by a child, the mother should be directed as to how to care for it, so as not to cause a heart involvement.

Hospital doctors should be even more careful than in the past not to dismiss any cardiac case before sufficient compensation is established. In some hospitals now the patient is not discharged until the social service worker has seconded the doctor's discharge. This insures the fact that the social service worker has investigated the conditions to which the patient is to return and made them as nearly suitable as possible.

When the patient is discharged careful directions should always be given as to the future care. The hospital doctors really have an exceptional chance to educate the patient. When a patient is down sick he is usually willing to listen to any advice that may help him to regain or retain health. If general instructions were given, each patient would be an educational force for his family and friends.

Doctors dealing with their own patients enter into detail more in their instructions. All doctors, however, do a certain amount of free work, so their aid should be enlisted in helping to free society from this great burden.

After the heart is once diseased the doctor is the important factor, but his work must be supplemented. It is then that provisions for special care must be made. This state especially needs convalescent homes for such patients. There they could be cared for after dismissal from the hospital much more cheaply, for such skilled attendants or expensive equipment are not

needed. A place to sleep, plenty of good but not expensive food, provisions for some exercise, and attendants to guide the patient in taking exercise, are all that is needed outside of the doctor to give general directions.

The objection made to institutional life in general is applicable here. Some cases should not be treated outside the home. If the family can watch the patient slowly return to health, they feel much more keenly the danger accompanying the return to normal life too soon. When a child is brought home looking bright and healthy, after a stay in the country or convalescent home, it is very difficult to make the average parents realize that even too much excitement during play can harm their child. The adult may often fare better at home under careful supervision for this same reason. If we could have such supervision as is given by Bellevue Hospital thru their cardiac class, home treatment would be profitable. In their report¹ they give a record of days spent in the hospital by 6 patients before and after coming to the cardiac class. One year before coming to the cardiac class these 6 spent a total of 251 days in the hospital. The year following their entrance into the cardiac class none of the 6 were in the hospital for a single day.

The work done under the supervision of this same institution at the Sharon Home, which has been mentioned before, is also very constructive. The patients are taken here at various ages and spend anywhere from a few weeks to several months under their care. The figures given deal with 49 men treated in the Home.

AGE ON ADMISSION

- 19 under twenty years of age.
- 18 between 20 and 30.
- 4 between 30 and 40.
- 5 between 40 and 50.
- 2 between 50 and 60.
- 1 man 60 years of age.

¹ Proceedings of New York Conference on Hospital Social Service, Vol. II, 1914-1915.

LENGTH OF STAY

Under 1 month.....	2	5 months.....	4
1 month	3	5½ months.....	1
5 weeks.....	1	6 months.....	2
6 weeks.....	1	7 months.....	2
2 months.....	6	8 months.....	1
2½ months.....	5	9 months.....	1
3 months.....	9	20 months.....	1
3½ months.....	2		
4 months.....	4	Total	49
4½ months.....	3		

While these patients were here an attempt was made to teach them some trade that would not hinder their progress in getting well.

When the patient returns to his home, if he does not know some remunerative trade, he must go thru the same process of adjustment as those who return from the hospital or have been cared for in the home.

CASE Y. One patient, who had been a stone-cutter before his break, left the hospital without any idea of what he could do for a livelihood that would not be injurious. He was told that heavy work of any kind would not be at all suitable. For a time he tried driving a laundry wagon. This necessitated a period of low income, for he had to work up his own route. The wife was very impatient. She could not see that he was doing what would be for the future good of the family. At last he was forced to give up the idea of caring for himself and went back to heavy work. The home life was so very unpleasant that the man deserted a few months ago.

When an attempt is made to aid a patient to change his occupation, the limited training usually stands in the way. He has usually done one thing all his life and knows nothing else. What does this mean? Certainly something is wrong with the great educational system that compels the student to remain in school until he is fourteen and then turns him out to "make a human derrick" of himself, as one patient said. This, to be sure, is drawing a conclusion from the older class of men, who were not influenced by the compulsory school system. It is to be hoped that this problem will be met less in twenty years from now.

For those deprived of this early training some other means should be employed to supplement the meager education. One of these means is found in the Sharon School experiment mentioned above. Other states and cities should establish similar schools.

Something very important, however, might be done by a law-making body of the community. This would make up for the former neglect and make the lives of the physically handicapped less a burden to themselves and friends. All such work with individuals, if it is to bear full fruit, must result in time in some form of legislation. Just what this should be no one positively knows.

Some general attention of the employers, too, should be given to the physical well-being of the employees. Some laboring men object to physical examination for fear they will be thrown out of their chosen line of work, but they should be made to see that a little care now may save years of suffering and unemployment later. While a man is earning the most money is the time to begin to save for the time when his earning capacity is less and needs are greater. Few will save unless compelled to do so. They should be forced to this, however, by the community, for it must bear the burden when poverty comes. By making some provision for this class to care for themselves, the great number that now become helpless and poverty-stricken in later life because of cardiac disease would be greatly reduced. For, as Henry Ward Beecher has said, "Poverty is very good in poems, but very bad in the house; very good in maxims and sermons, but very bad in practical life."

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INDIANA UNIVERSITY STUDIES



Study No. 43

THE SOCIAL SIGNIFICANCE OF MENTAL DISEASE AND DEFECT: A STUDY BASED ON THREE HUNDRED FORTY-FIVE MENTAL AND NERVOUS CASES REFERRED TO THE SOCIAL SERVICE DEPARTMENT OF INDIANA UNIVERSITY. By HELEN HUNT ANDREWS, A.M.

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*Submitted in partial fulfilment of the requirements for the Master's
degree in Indiana University.*

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Foreword

THIS thesis has been prepared under the direction of Dr. Edna G. Henry, as a partial fulfilment of the requirements of the Social Service Department of Indiana University for the degree of Master of Arts.

I wish to take this opportunity to express my gratitude to Dr. Edna G. Henry, to Miss Catherine Murray, Miss Elizabeth Tandy, and other members of the Social Service Department for their assistance, and to the Charity Organization Society, the Children's Aid Association, the Department of School Attendance, and the Juvenile Court for the use of their records.

HELEN HUNT ANDREWS.

Indiana University, June, 1919.

The Social Significance of Mental Disease and Defect

By HELEN HUNT ANDREWS, A.M., Head of the Social Service Department in the City Hospital, Louisville, Ky.

INTRODUCTION

THE Social Service Department of Indiana University began its work in September, 1911, with one worker and an office in the School of Medicine building, where the Indianapolis City Dispensary is located. It was thought that here was a field for research work as a basis for future sociological study. Furthermore, the Department could at the same time carry on a work of education and prevention. The work of aiding in the care and cure of the patients was its first business, as it is the business of all medical social service. Along with this, from the very first, records of the patients were carefully and fully kept to be used as teaching material.

With the opening of the Robert W. Long Hospital in 1914 the main office of the Department was moved to that building, a branch office being retained in the School of Medicine building. The Department employs a hospital worker who takes care of the patients referred to her there, and a state worker who follows these patients into their homes out in the state to see that they are carrying out the doctor's orders, to get family histories or facts of the environment, to report to the doctor and put upon the record. All records of these cases are kept and used as material for sociological study.

A committee of interested individuals in the city of Indianapolis maintains the office at the City Dispensary and employs the worker there.¹ As both offices are under the direction of Dr. Edna G. Henry, they work together and the records of each are accessible to the other.

¹ From July 1, 1918, to July 1, 1919, funds were supplied by the War Chest.

In the dispensary the patients are referred to the Social Service Department from the various clinics by the doctors. A doctor wishes home conditions investigated, a change of employment secured, a prescribed diet supervised to see that it is followed, an obdurate parent persuaded to consent to an operation for his child, or many other things done for which the doctor himself has no time, and yet which may be all-important for the cure of the patient. The task of the social worker on a certain case may be merely to refer it to the proper social agency. She can and does tell the patient where he can receive the necessary aid and also reports to the agency concerned what she knows of his character and his needs. Other agencies, in turn, refer to the Social Service Department persons needing medical care who perhaps come to the dispensary for the first time. They may thus be assisted and steered to the proper clinic, and taken as cases by the worker. Later a report of the doctor's findings or his diagnosis and the method of treatment advised by him is made to the organization which referred the patient.

In the State Hospital the method of the Social Service Department is somewhat different from that in the City Dispensary. Since October 1, 1915, all new free and part-pay patients have been the subjects of routine inquiry, and certain types of cases are always followed. More than seven thousand cases have been handled by the Department, thru both offices, between September 20, 1911, and April, 1919.

The patients considered in this paper have been referred from the Mental-Nervous Clinic of the dispensary, or have been in the hospital, and each has a definite diagnosis of some mental or nervous disorder. The first patient referred to the Social Service Department in its beginning was from the Mental-Nervous Clinic.² There may be a significance in this fact, for the mental-nervous patient has proved, more than any other, to be a subject for social service. The doctor usually wants to know about the patient's environment, family and industrial life, and facts of his heredity. These can best be discovered by the social worker who visits the home and perhaps the factory and homes of relatives, who becomes a friend of patient and family and listens to the telling of their troubles, often thereby discovering the source of the difficulty.

As it is in this group that many of the "undesirable citizens" are found, it has been a field for study along biological as well as

² Dr. Charles E. Cottingham referred the case.

sociological lines. The inheritance of feeble-mindedness has been established as a scientific fact, but the amount of feeble-mindedness which may be expected in the family where only one parent is defective, the relationship between epilepsy and feeble-mindedness, alcoholism and epilepsy, and other similar questions are as yet unsettled.

In this study there has been no attempt to settle any of these questions, but some facts have been gathered together, some definite observations have been made which, it is hoped, may throw a little more light upon them and lead to continued social thinking about them.

I. THE GENERAL PROBLEM

THE mentally diseased or defective are those persons in society who, in their associations with their fellows and in the conduct of their everyday lives, are unable to meet the normal standards of reaction. The former are those whose brain tissues have followed the normal course of development but have been attacked by disease. In this group are included those who have a temporary disorder due to some exhaustive disease attacking other parts of the body as well as those suffering from true insanity. The latter are those whose brain-cells have never developed normally and there is no more hope of their becoming normal-minded persons, no matter what therapeutics or methods of education may be adopted, than for the dwarf to become a normal-sized man.

The patients to be used for this study have been divided according to diagnosis into the following groups: (1) the feeble-minded; (2) the epileptic; (3) the insane; (a) true insanity; (b) the epileptic; (c) miscellaneous mental and nervous disturbances.

No hard and fast lines can be drawn between these groups as they often overlap. A feeble-minded individual may also be epileptic; an alcoholic may be feeble-minded; an epileptic may develop paresis, etc. Where there is more than one diagnosis, the individual has been classed according to his most outstanding characteristic from the social point of view.

1. *The Feeble-minded.* The feeble-minded person has a defective brain so that his mind can never develop beyond that of a child. There are three grades: the lowest, the idiot whose mental age never exceeds two years, no matter what his physical age may be, and who requires the care of an infant thru life; the imbecile, who has a mental age of seven or eight years and is capable of attending to his own bodily needs and perhaps of learning some simple manual tasks; the moron, who attains a mental age of twelve years, and to the casual observer and often to the scientifically trained is not distinguishable from the normal. He is incapable of abstract thought, lacks judgment, and has no moral sense with which to meet emergencies, however, hence is easily misled and tempted to wrongdoing. In the group of defectives to be dealt with in Chapter II of this paper have

been included a few cases of hydrocephalus and cretinism, because these individuals, while presenting a different pathological condition, involve the same social difficulties.

The social problems connected with the presence of the mental defective "in our midst" are generally known and discussed by the public today. Articles have appeared in late years in most of the leading magazines and newspapers on the subject and various methods of care advocated.

Better care for the feeble-minded is a live issue—a burning, paramount issue, if we judge by importance rather than by the prospect of any early satisfactory outcome, in every American state and in every nation of both hemispheres. It is more important than illiteracy or Americanization.¹

Since it has been demonstrated that feeble-mindedness is hereditary, that feeble-minded parents can have *only* feeble-minded children, people have begun to realize the necessity for prevention of procreation among them. They have come to believe in "a conscious improvement of the human race by the application of the laws of heredity to the human being".² Sterilization and segregation are the methods most generally indorsed, segregation perhaps meeting with more general favor. In 1916, thirty-four states maintained public institutions for the care of the feeble-minded, the oldest being that of Massachusetts, established and opened in 1848, and eight states had passed sterilization laws, Indiana being first in 1908.

As a social menace, mental defect has come to be recognized by relief agencies as one of the underlying causes of poverty.

The practical definition of a feeble-minded person is one who, though capable of providing a living with his hands, is unable, by reason of mental defect, to make his living in competition with his more intelligent fellows. When we realize that the feeble-minded citizen is by definition a pauper, and when we further consider that the condition breeds as true as the spots on a dog, we can vaguely picture to ourselves the tremendous social saving in preventing their propagation and the incalculable social waste attending our neglect to catch this social opportunity at its flood tide.³

School authorities are studying retardation and seeing the effect of the presence of subnormal children with normal ones and the consequent lowering of standards.

¹ "Arousing Interest in the Feeble-minded", *Survey*, April 26, 1919, p. 158.

² Professor Scott Nearing.

³ Robert W. Kelso, Secretary State Board of Charity of Massachusetts, "Feeble-mindedness as an Element in Poverty", *Boston Medical and Surgical Journal*, Vol. CLXXVII, p. 487, October 4, 1917.

Without doubt 10 per cent of the school children need special instruction, and probably 2 to 3 per cent are feeble-minded. In this study (of the children in the schools of one county in Indiana) 2.5 per cent were found to be three years or more retarded.⁴

Morally, the mental defective is perhaps the greatest menace. The moral sense is said to exist in the higher brain centers and if these are lacking or defective, the person is irresponsible and is unmoral if not immoral. Moreover, statistics show that 80 per cent of the prostitutes are feeble-minded. Because of this fact, however, responsible persons of normal mentality are often excused of immorality on the ground that they must be defectives.

The social worker who sees these defectives and knows the problems they present realizes very strongly the need for institutional care. However, she also sees the beneficial results obtained by careful supervision of them in the community. While this is difficult and not altogether safe, the fact that there will be large numbers which will not be cared for institutionally for some time to come, no matter what legislation may be passed, justifies her efforts.

2. *The Epileptic.* The epileptic has a pathological condition whose cause is unknown. He is subject to seizures during which he loses consciousness and may fall wherever he is, often inflicting serious injury. There are certain mental manifestations which accompany these attacks which make the social aspects of the disease very important.

There have been many theories as to the cause of epilepsy: alcoholism of parents at the time of the conception of the child; infectious disease of either or both parents, as tuberculosis or syphilis; injury during labor or delivery; infectious disease in infancy of patient, as spinal meningitis; head injury of patient. However, none of these has been authoritatively accepted as the general cause, tho each may be demonstrated in individual cases. As no successful medical social case work can be done without diagnosis and a knowledge of the cause of disease, the social worker is handicapped by the lack of medical knowledge on this subject.

The presence of the epileptic in the household presents a serious problem. In the first place the economic situation is handicapped if the person is an adult, for he cannot be a successful wage-earner. He cannot be trusted to work with machinery

⁴ Second Report of the Committee on Mental Defectives in Indiana, March 6, 1919, p. 32.

in a factory or to drive an automobile, or any such employment where he would endanger the lives of others as well as his own. Almost no employer will hire him if he knows of his disease. What he can and should do is farm work, but this is not always possible due to other circumstances in the family.

It is also unsafe to leave one of these individuals alone, especially when the disease has reached a rather advanced stage, as he may sustain serious injury during a seizure, or may become violent and destroy property. It is unsafe to leave him with small children because of the ill temper, often accompanied by loss of memory, which usually precedes or follows a seizure and may lead to acts of violence.

The epileptic does not make for happiness and cheer but is characterized by irritability. He is usually also given to lying, his imagination being so strong that he cannot distinguish between truth and falsehood. Another outstanding characteristic is his excessive appetite. He usually craves meat, which the doctor says he should not have. If he gormandizes, especially in the evening, he is more likely to have a seizure. As the disease progresses and the seizures become more frequent, mental deterioration becomes evident. Maniacal insanity may result at the time of seizures and the patient become so violent that he must be placed in a padded cell. Simple dementia may result so that he resembles a feeble-minded child.

Because of the progression of this disease and its social aspects, its victims should be segregated in institutions or colonies. It has been found that farm life is most beneficial and the number of seizures can be greatly reduced by this life in the open and medication. In 1916, thirteen states were maintaining separate colonies for the care of epileptics. Many others have institutions admitting both feeble-minded and epileptic persons.

3. *The Insane.* (a) *True insanity.* In *Heredity in Relation to Eugenics* Charles B. Davenport says:⁵

The marvelous complex of neurones (nerve cells and fibres) sustentative tissue, and blood-vessels that constitute the central nervous system, forms, perhaps, the most wonderful mechanism in nature. Little wonder that it should become easily deranged. Such variations in structure and such derangement though ordinarily hidden from view can be inferred from the behavior of the person. For the general principle holds that every psychosis (or peculiar mental manifestation) has its neurosis (or aberrant

⁵ Chap. iii, p. 92.

nervous basis). Peculiar or abnormal behavior, then, is an index of peculiar or abnormal brain condition.

True insanity always has a physical basis, that is, there is an actual breaking down of the nerve cells. Certain forms of insanity, as paresis, have been found to be due to some infectious disease which finally affects the nerve centers. In other forms the cause is not so clearly demonstrated, as dementia praecox.

From the social point of view it is necessary to call the layman's attention to the simple facts of mental disease. Employers, especially, should be able to recognize when an individual is mentally sick and needs a doctor's care. It used to be the prevailing notion that all insane people were raving maniacs requiring the straight-jacket and the padded cell. However, some enlightenment has come thru popular articles in periodicals in more recent years and thru the founding of the National and State Hygiene Societies whose meetings are open to the public and whose literature is widely distributed.

It must be realized above all that mental sickness is just as real, but far worse than physical sickness. It should be dealt with in a common-sense way until professional services can be secured. It is remarkable how closely mental abnormality approximates the normal, especially the normal under stress. All acute mental disorders are better taken care of in a hospital for their especial care, and all incurables should have permanent institutional care.

It is the social worker's duty often to persuade families to file inquests on some of their members and send them to institutions. The plea of safety for the rest, especially the children, usually overcomes regard for the patient and unwillingness to have him leave the family circle. Early recognition of mental disorder and immediate expert medical attention may mean the prevention of an incurable condition. In visiting the homes of patients the observing social worker will be able to recognize many deviations from normal mentality and may advise examination. She will doubtless be impressed by the number of instances where different manifestations of mental disease occur in the same family.

(b) *Psychoses not true insanity.* The psychoses which are not true insanity include such diseases as hysteria, neurosis, and neurasthenia. General interest has been awakened in this group thru its war manifestations. Those who were greatly impressed

by the stories of "shell shock" are somewhat surprised to know that it is only the neurosis of civil life placed in a new environment. It is only "nervousness" and not a new insanity. Those persons are subject to it who have had a case of "nerves" under other great stress. Since this has been discovered, the method of treatment for patients has been entirely changed. Men who were formerly sent back to the hospitals from the trenches with slight shock are now encouraged by their regimental officers to "carry on". They are not allowed to get the mental impression of invalidism, but are given confident assurance of complete recovery.

Many neurasthenics are taught to be so self-centered and obsessed by self-pity and introspection that they unconsciously lay themselves open to suspicion, by those who have no special medical knowledge, of being mentally afflicted. Nevertheless, neurasthenia and insanity are two totally distinct diseases. The one does not merge into the other, and if a man's case is diagnosed as neurasthenia and he subsequently becomes insane, an error in diagnosis has been made and the early symptoms of insanity have been mistaken for neurasthenia. I think it a matter of considerable importance in the interests of neurasthenics, especially of the severer types, and that this should be clearly recognized.⁶

The medical profession as well as the layman has learned much from the war manifestations of disease which will aid in the treatment of patients in civil life. Colonel Collie says: "It is not cowardice, nor fraud, nor malingering, nor self-deception, but a real disease." As many of the milder forms may be found in almost any group of people, a knowledge of the best methods of dealing with it would be most helpful to everyone. Most normal individuals have moods, and these in exaggerated forms become psychoses. A healthy, normal environment is the first essential factor for cure. "Infinite patience, common sense at every turn, and real but thoroughly disguised sympathy are essential in those who undertake the care of such cases."⁷

(c) *Miscellaneous mental or nervous disturbances.* In the group designated as miscellaneous mental or nervous disorders are included the drug habitués, choreics, and thyroid cases. They are related to the insane, tho not necessarily actually belonging to them. They may present as great problems to the social worker and illustrate the need for restraint outside of institutions. Since the passing of the Harrison law and its recent more strict

⁶ Colonel Sir John Collie, M.D., A.M.S., "The Management of War Neuroses and Allied Disorders in the Army", *Mental Hygiene*, Vol. II, 1918, p. 3.

⁷*Ibid.*, p. 9.

enforcement there are fewer drug addicts. There has been a forced cure in many places, by the gradual reduction method, drugs being obtained only thru dispensaries, hospitals, or certain physicians appointed by law. The after-care of these cases is very important if they are to return to normal, useful living. They have had an abnormal mental outlook, and must be furnished now with wholesome environment and such associations as will stimulate healthy thinking and living. Suitable and pleasant occupations will go far in accomplishing this.

Cases of Sydenham's chorea (a disease of the cerebral hemispheres) occur usually in children and are caused by infection frequently traced to the tonsils. Its symptoms are the lack of muscular control giving rise to involuntary, irregular, and unpurposeful movements of the arms and hands, the legs, and often the face. There is usually sleeplessness also and excessive irritability. Children in such a condition must be excluded from school, perhaps required to take rest in bed and given a simple but nourishing diet. If the disease is properly treated in its early stages and the source of infection removed whenever possible, gradual recovery is begun at once. However, too often, parents do not recognize the disease at its onset or do not attach sufficient importance to it to seek medical advice. It continues and grows worse; the infection reaches the heart and does serious and lasting damage or affects the joints and causes rheumatism. The social worker can help here first by calling parents' attention to the disease and persuading them to secure medical care for their children. She can then insist upon the carrying out of the doctor's orders. This is not an easy thing to do, as the parents, tho well-meaning, often allow sentiment to overcome common sense and do not force the child to submit to the prescribed treatment. It is true that the child is often difficult to control. He is petulant, cross, given to fits of temper and to crying spells. However, overcome the disease and the child will regain his good disposition.

Huntington's chorea is perhaps more closely related to the insanities. It is hereditary thru the female line, is incurable, and leads to mental deterioration. It typically appears first in middle life. All of it which exists in the United States today is believed to have been transmitted from one family which settled in the New Haven colony. Institutional care should be provided for all cases of this disease and prevention of marriage of individuals afflicted with it, that it may be stamped out.

Thyroid cases fall into this group of the mental and nervous disorders. Among them are found the cretins who lack sufficient thyroid substance which in some way is connected with the development of the brain. Children who are dull mentally and found to be cretins improve greatly under feeding of thyroid extracts. There are also the cases of hyperthyroidism, and of several different kinds of goitre. These cases often have a mental reaction which very nearly resembles insanity. Their extreme nervousness, irritability, and markedly self-centered attitude makes them unwelcome companions and a disturbing element in the home life. In the beginning it is often difficult for the family or even the patient to realize that he, or usually she, is actually sick. Here again, prompt expert medical attention is necessary to a rapid recovery. Under medical or surgical care complete recovery usually ensues. These patients, like the choreic children, are not normally-minded during their illness, and are most difficult to handle. This is especially true of the adults, who often cannot be persuaded nor coerced into following the measures prescribed for their cure.

It will be noted that the social aspects in each form of mental disease or defect are most significant. The following chapters will attempt to point out by examples some social problems presented by each group.

II. THE FEEBLE-MINDED

CERTAIN great degenerate families in America have been made the subject of study and their histories recorded. Notably among these are the Jukes, whose history was first written by Robert L. Dugdale more than forty years ago, and the Kallikaks, more recently studied by Henry Herbert Goddard. It is interesting to read and compare these two volumes, as the older one was concerned with the influence of environment rather than heredity, while the latter one presents a study in heredity.

The problems connected with the presence of the feeble-minded in society have of recent years become familiar to all who read the magazines and newspapers. The general public has in a measure come to understand the necessity of institutional care and the preventing of procreation among defectives.

We know now that we have to deal with a growing group in our community who demand permanent care and control as well for their own sakes as for the welfare of the community. All are now agreed on the general principle of segregation, but it is true that something more than this should be forthcoming. The difficulties of theory are clearing up as our wider view obtains a firmer grasp of our material, but the difficulties of practice are still before us.¹

It was formerly believed that feeble-mindedness was mainly due to depravity, drink, general disease, or malnutrition of the parents, and to environmental conditions, but these factors, tho recognized as serious and frequent, are no longer believed to be fundamental.

Feeble-mindedness is essentially a variation, belonging to the same large class as all other biological variations, occurring, for the most part, in the first place spontaneously, but strongly tending to be inherited. It thus resembles congenital cataract, deaf-mutism, the susceptibility to tuberculous infection, etc.²

The problem of care of the low grade feeble-minded is comparatively easily solved, because he is so obviously a helpless and irresponsible member of society and can best be cared for in an institution. The higher type, the moron, is less obviously mentally defective, can often be an earning power in the family and thus an asset. This may be a more potent factor as an argument for keeping him within the family circle than family ties and

¹ Dr. R. J. Ryle at Conference on Feeble-mindedness (*British Medical Journal*), October 3, 1911.

² Havelock Ellis, Introduction to *The Task of Social Hygiene*, p. 33.

affectionate regard. Because this moron may be able to pass for normal to the casual observer, he is all the more dangerous as a member of society. He is defective and hence lacks judgment, moral stamina, and decision. He is a prey to the unprincipled exploiter who misuses him. He may become a criminal and be punished as such, only to become a "repeater" when released to life in society once more.

The study of the relation of mental defectiveness to juvenile and adult delinquency has been carefully studied only in the last few years, and various statistics have been published showing that a considerable number of the delinquents now in institutions are mentally defective. There is such a variation in these statistics, however, that no conservative figure can be quoted at the present time. Individual cases here and there, however, show that there is a close correlation between mental defectiveness and delinquency.³

When a child's defect is hereditary from one or both parents, this defect is usually increased and exaggerated by his lack of early training and the unwholesome environmental conditions which are apt to exist in the home. Such parents are unqualified to rear their offspring by reason of their own mental subnormality.⁴

The defective should be committed thru court to institutional care for life. He can then be cared for and, whenever possible, trained in such a way as to make him a useful member of the community of which he is a part. He will not be able to pass his defect down to succeeding generations, nor will he be as likely to commit crime or indulge in vice.

Some one lately and aptly has said that the mental defectives include the 2 per cent of the general population lowest in the scale of intelligence. This is near the truth, and being so, the burden of their care should not stagger the 98 per cent, or normal population, nor would it, if systematically or thoroughly done.⁵

However, if institutional care is prescribed, adequate institutions for the purpose must be provided and all defectives removed from other state and county institutions. The accompanying table (I) of mental defectives in institutions in Indiana on September 30, 1916, shows the deplorable situation regarding the feeble-minded.

³ Report of Committee on Mental Defectives in Indiana, November 10, 1916, "Mental Defectives in Indiana", p. 24.

⁴ Dr. Charles F. Neu, Indianapolis.

⁵ Report of Committee on Mental Defectives in Indiana, November 10, 1916, "Mental Defectives in Indiana", p. 3.

TABLE I. FEEBLE-MINDED IN COUNTY AND STATE INSTITUTIONS

	MALE	FEMALE
State Prison	42	..
Woman's Prison—		
Correctional Department .....	..	1
Penal Department .....	..	7
Indiana Reformatory	106	..
Indiana Boys' School.....	323	..
Indiana Girls' School.....	..	80
Indiana State Farm.....	7	..
School for Feeble-minded Youth.....	506	619
Marion County Asylum for Insane.....	8	2
County poor asylums.....	436	345
County jails .....	..	4
Orphans' homes	67	47
	<hr/>	<hr/>
Totals for each sex.....	1,495	1,105
	<hr/>	<hr/>
Grand total		2,600

Of the 100 defectives used for this study only 22 are or have been in the School for Feeble-minded Youth, altho in almost every case, excepting the males over sixteen who are not eligible, all effort has been made to secure application.

Two of the reasons for failure are: first, the unwillingness of the parents to send their children to the institution; and, second, the amount of time and work necessary for a social worker to put upon such a case to complete the details. When there is an insufficiency of workers, such tasks are apt to be neglected. If less than 25 per cent of these cases diagnosed in the State Hospital and City Dispensary reach the proper institution, is it not indicative of an error in the system? It is hoped that the law passed by the 1919 legislature making admission by court commitment instead of application by parent or guardian as formerly, together with the provision for a new and larger institution, will aid Indiana to care for more than 7.1 per cent of her mental defectives.

Table II shows that of the 100 individuals in this group there are 57 males and 43 females. The table shows ages also.

TABLE II. CLASSIFICATION BY AGE AND SEX

	OVER SIXTEEN	UNDER SIXTEEN	AGE UNKNOWN	TOTAL
Males	19*	31	7	57
Females	23†	20	..	43
Totals	42	51	7	100

*This includes 4 married who have 5 children.

†This includes 11 married who have 12 children. Seven illegitimate children are also recorded.

What is the social significance of these data? First, it is rather a surprise, perhaps, to find a predominance of males in the first 100 feeble-minded patients referred to the Social Service Department. When it is further discovered that the large number of females and more than one-half of the males are over sixteen years of age, the situation becomes more complicated. As the School for Feeble-minded Youth—the only institution in Indiana for the care of the feeble-minded—does not admit males over sixteen, and its department for adult females is very limited in capacity, it becomes evident that a large number of these must remain in the community.

Clarence B. is a moron, age twenty-six, the son of a drunkard and a hard-working, commonplace but virtuous mother. He boasts of having married seven women. He was in Juvenile Court on a charge of incorrigibility when sixteen years old and care in the School for Feeble-minded Youth was then advised. He was instead sent to the Boys' School at Plainfield, and released on parole after two years. He roamed about and became known to the police in several cities, told many stories of his parentage and his experiences which were later found to be untrue. He told of his marriage in Kentucky, describing his wife's appearance, her work in the cotton mills, etc., and later told of proceedings for a divorce because of her infidelity. It was afterwards learned that the patient had never been to Kentucky, was not married, and that these tales were but products of his imagination.

The 11 married women are reported to have 12 children, while the 4 married men have 5 children. Adding to this 7 known illegitimates, there is a total of 24 children. According to the laws of heredity of feeble-mindedness, all evidence would indicate that a large number of these are defectives. It might be added that there were perhaps other children unrecorded and also that,

as most of these parents are yet young, there is ample opportunity for additional offspring. It is said that the average number of children of feeble-minded parents is 7 as compared with 3 of normal-minded parentage.

Retta J. is of the Mongolian type, admitted to the School for Feeble-minded Youth at the age of twenty-three. Her father was a wanderer, syphilitic and alcoholic; of her mother little is known except that she died in childbirth. Retta was one of 18 children, 4 of whom are living. She had spasms as a baby, was cross-eyed and never able to talk plainly or intelligibly, and is color-blind. Her first illegitimate child, a boy, was born in 1912, and her second, a girl, was born in 1916 in the Robert W. Long Hospital. Thru the assistance of the Juvenile Court, the children were placed in orphans' homes and the mother sent to the Custodial Department of the School for Feeble-minded Youth in the early part of 1917.

Newton T., formerly an inmate of Julietta Hospital for Incurable Insane, married Maggie C., a feeble-minded woman. They had 10 children, of whom 3 died in infancy, 3 are now in the School for Feeble-minded Youth, 1 is reported married to a mental defective, 1 has an illegitimate child, and of the other 2 nothing is known.

Charles S., age twelve, is a defective physically and mentally. He did not walk until five years old, has a speech defect, and is anemic. He was unable to go beyond the first grade of school. His father died of tuberculosis and his mother was "too defective to give accurate history".

It will be noticed in Table III that, while the majority in this group are white Americans, there are 9 colored, 1 foreign-born, and 5 of foreign-born parentage. It is interesting to note that of the 9 colored, 5 are in the institution, while application papers have been filed for the sixth. Of the other 3, 1 is in a special school in the city, 1 is married after having given birth to an illegitimate child, and 1 has shown such marked musical ability (altho unable to go beyond the fourth grade in school) that funds have been raised by interested individuals to secure additional musical education for her.

The one foreign-born is a Russian Jewish boy graded as a moron, whose application to the School for Feeble-minded Youth was rejected on the ground that it did not show sufficient evidence of mental defect.

Abe G. was brought to the United States at the age of four years by his parents. His mother tells the following story to account for his mental defect:

As the steamship was entering New York harbor little Abe fell overboard. After several hours he was rescued and revived. The doctor and nurses worked with him a long time to get the water off his brain. He was sick for a week and then apparently recovered. However, there must still be some of that water on his brain or he would be more like the other children.

Abe does not do well with abstract work in school and has failed to make his grades. What concerns his parents more, he shows no desire to work and earn money. The other children in the family have clothed themselves by their earnings at his age and he cannot even keep a paper route.

Of foreign-born parentage there are 2 Germans, 1 Russian Jew, 1 Austrian, and 1 Mexican. Of these, 3 are being cared for in the institution. One is Retta J., mentioned before as the mother of 2 illegitimate children, 1 is a cretin, 1 a low grade moron with chorea and a history of alcoholism of his parents. Of the 2 who are at home, 1 is a case of congenital syphilis and the other of spastic paraplegia.

TABLE III. CLASSIFICATION BY RACE AND NATIONALITY

	MALE	FEMALE	TOTAL
White American	49	36	85
Colored American	4	5	9
Foreign-born	1	0	1
Of foreign-born parents.....	3	2	5
	<hr/>	<hr/>	<hr/>
Total	57	43	100

In the classification of defect as given in Table IV there is found to be the largest number of imbeciles and morons. As the unclassified would probably all fall into one or the other of these grades, perhaps the majority being morons, there is a predominance of the group which is the greatest social menace. The idiot is easily diagnosed, but the higher grades require skilful testing for correct classification.

Of the idiots, 1 only, an epileptic, is in an institution. One other is a female with epilepsy whose parents desire institutional care but cannot secure it until the completion of the buildings for women at the Indiana Village for Epileptics. Of the imbeciles, 10 are in the School for Feeble-minded Youth, 1 was discharged from there, and application is filed for another. There are 3 who have a complication of epilepsy and of these 1 is in the Village

for Epileptics; 1 female was so violent that she was placed in Julietta Hospital pending the completion of the buildings for women at the Village; 1 is cared for at home. Of the morons, only 1 male and 1 female are in the School for Feeble-minded Youth, and 1 male is in the Epileptic Village. There are 6 males and 2 females who have formerly been in institutions. Of the unclassified, 4 males and 3 females are in the School for Feeble-minded Youth, 1 male is serving a sentence in Jeffersonville, while 2 males and 2 females were formerly in institutions; of the 6 cretins, 2 are in the School for Feeble-Minded Youth.

TABLE IV. CLASSIFICATION BY DIAGNOSIS SHOWING THOSE IN THE SCHOOL FOR FEEBLE-MINDED YOUTH

	NUMBER	IN INSTITUTION
Unclassified	48	8
Morons	19	2
Imbeciles	20	10
Idiots	6	0
Cretins	6	2
Hydrocephalics	1	0
Total	100	22

Olive D. was brought to the hospital when four years old for diagnosis; her mother was epileptic and her father's brother was described by the family as "not just right". Instruments were used at the patient's birth. Later she was found to be an idiot, but thyroid extract was recommended as an experiment and she was discharged to her home.

Louise T., an imbecile of nine years, died at the School for Feeble-minded Youth in 1917. Her father and mother were first cousins. Her father is dull mentally; her mother died of measles and tuberculosis. Her mother's mother's father was insane and an inmate of Central Hospital. His son's daughter is now in the School for Feeble-minded Youth. Louise's mother's brother, who is also her father's mother's brother, is an inmate of the Central Hospital for Insane. Her father's mother died of paralysis, her mind being affected for three years previous to her death. Her mother's sister is of doubtful mentality.

Alice R. is a colored woman now twenty-eight years old who has been for three years in the Custodial Department of the School for Feeble-minded Youth. She is an imbecile, syphilitic, and partially paralyzed. Her father died of pneumonia; he used alcohol to excess. Her mother is feeble-minded and is now mak-

ing every effort to withdraw Alice from the institution. While she has a real affection for her daughter, she says, "If Alice can do laundry work up there, she can do it here and help me keep house too." (She has a fairly large boarding-house.) No amount of persuasion will induce her to believe that Alice is better off where she is and that she would prove more of an economic burden than an aid.

Pansy C. is a moron, now eighteen years of age, described as "having the ways of a child". She was reared in an orphans' home and at sixteen allowed to work out as a domestic. Her employer says she was very erratic and subject to moods, often morbid and given to crying spells. She was returned to the Home, from which she later ran away, in company with another girl, and was traced to a town not far distant where she was working in a factory. She was again returned to the Home, but later sent to her mother, who will now assume all responsibility, in a large city. What the results of this arrangement will be can only be imagined.

The relatively small number out of this group in the School for Feeble-minded Youth has been mentioned elsewhere. It will be noted in Table V that here again the majority are males. Those in other institutions at present include the feeble-minded epileptics who have been sent to the Village for Epileptics and the female epileptics who are temporarily housed in hospitals for the insane. Of those who were formerly in other institutions, some came from orphans' homes, several had been sentenced to the Girls' School at Clermont or the Boys' School at Plainfield, 1 came from the Woman's Prison, and 1 from the Detention Home. The number convicted of crime is rather small and the crimes in most instances were petty. Of the boys 3 were convicted for stealing; the offenses of the other 2 are unknown. One girl was said to have slain her illegitimate baby; the other was a Woman's Prison ward, but her offense is unrecorded.

TABLE V. INSTITUTIONAL CARE

	MALES	FEMALES	TOTAL
In the School for Feeble-minded Youth	14	8	22
In other institutions.....	3	2	5
Formerly in other institutions.....	10	4	14
Convicted of crime.....	5	2	7

Of those not in institutions there are 52 city residents and 21 small town or country residents. However, of the city residents, 21 were born in small towns or the country and many had lived

in the city less than three years. This bears out the theory that the migration of the feeble-minded is from country to town, from town to city. If these individuals are living in the community, the city is the worst place for them from an economic point of view as well as a moral one. Here they have greater competition in the task of earning a livelihood, or eking out an existence; they have more opportunity for vice and immorality of all sorts, and are the prey of exploiters. However, there is greater opportunity for the education of their children or special school training; there is less chance of consanguineous marriage with its consequence of greater degeneracy and defectiveness.

Fifty-four of this group were known to other social agencies, including township trustees, charity organization societies, juvenile courts, children's aid associations, school attendance departments, and other institutions and hospitals. The great expense of the defective to the community has been emphasized by all speakers and writers on the subject. If all of the money which has been spent upon relief for the feeble-minded in the state could have been spent for providing institutional care for them, the problem would be solved today. "It is estimated that the tribe of Ishmael in Indiana, comprising five thousand persons in six generations of feeble-mindedness, absorbed three-fourths of all the public poor relief funds of the country."⁶

It has been demonstrated that feeble-mindedness is hereditary, but what of other factors which may be causative? What of the part played by tuberculosis, syphilis, alcoholism, etc.? The table of heredity of the group studied, while incomplete and perhaps inexact because based on information secured largely from the patients' families, shows a few interesting figures. There are 8 persons who are known to have had feeble-minded parents; 9 have defective brothers or sisters; 9 have defective relatives (cousins, uncles, aunts, grandparents); 4 are known to have feeble-minded children.

Whether tuberculosis plays a part in bringing about defect or not is a subject for physicians and students of heredity to answer, but it is interesting to the social worker to note the number of instances in which it appears. Certainly syphilis of the parent, if of the mother, often means a luetic condition of the children and a consequent probability of defect.

⁶ Robert Kelso, "Feeble-mindedness as an Element in Poverty", *Boston Medical and Surgical Journal*, October 4, 1917, Vol. CLXXVII, p. 486.

It has been mentioned elsewhere that there is frequently found a complication of mental disorders in the same family. To the social worker this means eternal vigilance in her psychopathic work and effort to recognize the early manifestations in order to secure the proper care and whenever possible to forestall acute conditions. It will be noticed that 4 defectives have insane parents, 1 has an epileptic mother, and 6 have parents afflicted by some nervous disorder.

Whether alcoholism is a cause of feeble-mindedness or feeble-mindedness is a cause of alcoholism cannot be answered here, but it is known that the two often go together. Nine of these defectives had alcoholic parents. By experiments, alcohol has been proved to have direct effect upon the germ cells a short time after entering the body. Hence, at conception this might impair development of the fetus and result in mental or physical defect. On the other hand, Mr. Kelso says: "Alcohol, though boasting many converts from the ranks of the highly intelligent, gets first and most frequently into the head that has the least power to visualize the consequences, least strength to appreciate the scope of life's daily problem."⁷

TABLE VI. HEREDITY

Syphilis in parents	17
Tuberculosis in relatives.....	12
Tuberculosis in parents.....	9
Feeble-mindedness in brothers and sisters.....	9
Feeble-mindedness in relatives*.....	9
Alcoholism in parents.....	9
Nervous disorders in relatives.....	9
Feeble-mindedness in parents.....	8
Nervous disorders in parents.....	6
Tuberculosis in brothers and sisters.....	5
Insanity in parents.....	4
Feeble-mindedness in offspring.....	4
Nervous disorders in brothers or sisters.....	3
Insanity in relatives.....	2
Alcoholism in relatives.....	2
Insanity in brothers or sisters.....	1
Epilepsy in parents.....	1
Epilepsy in brothers or sisters.....	1
Total	112†

*Relatives include only cousins, uncles, aunts, grandparents.

†Some persons are counted more than once, i.e. Alcoholism and also Feeble-mindedness.

⁷ Robert Kelso, "Feeble-mindedness as an Element in Poverty", *Boston Medical and Surgical Journal*, October 4, 1917, Vol. CLXXVII, p. 485.

When it is remembered that this study covers only a small group of patients known to five social workers in one department from September, 1911, until April, 1918, the magnitude of this problem of the mental defective becomes evident. The first three points of the conclusions reached by the Indiana Committee on Mental Defectives are noteworthy:

1. Existing social conditions are complicated by the presence of defectives in the community.
2. The value of reconstruction plans for the future will be discounted by the defectives employed by our industries and by those forced into idleness because of unfitness.
3. Education of the public regarding the facts relative to mental defect is necessary to the solution of the problems arising therefrom.

III. THE EPILEPTIC

NOTWITHSTANDING the report that some of the great men of history, notably Caesar and Napoleon, were victims of epilepsy, this disease is now known to be usually associated with degeneracy. It is mixed with alcoholism, insanity, feeble-mindedness, tuberculosis, and many other disorders. Altho known to physicians for centuries and comparatively easy of diagnosis, the general cause of epilepsy is as yet undetermined. Research laboratories have been established in connection with some of the state institutions for the care of epileptics and many valuable contributions thus made to literature on the subject. No cure has been found, but old and new methods of treatment have been carefully studied to determine, in individual cases, those resulting in improvement of the patient or arresting the progress of the disease.

Because of the lack of medical knowledge regarding epileptics, social work among them is handicapped. However, some things have been learned which are of great help in the practical handling of these cases. Direct heredity is a marked factor, determined in from 15 to 20 per cent of those admitted to state institutions. Insanity or other mental disorders are found in the ancestors of a large proportion of those afflicted with epilepsy. "We find that the family history in over 60 per cent of the cases shows epilepsy or some other neurosis in the near relatives."¹ "One need not hesitate to state that the effect of hereditary influences can be well established in 60 per cent of the cases of epilepsy and feeble-mindedness admitted to our institutions."² This fact alone should be sufficient argument for the prevention of the marriage of epileptics.

Those who have epilepsy are economically dependent because of their inability to do many kinds of work and their forced periods of idleness. Farm work and an out-of-door life are most suitable for these persons and most of the institutions are built to provide for such a life. Those who are physically able can thus be profitably employed, at the same time being personally benefited. Life free from responsibility, excitement, and hurry; following a

¹ G. G. Kineon, M.D., Superintendent of the Ohio Hospital for Epileptics, Gallipolis, Ohio.

² Wm. T. Shanahan, M.D., "Why the Marriage of Defectives Should Be Prevented When Possible", *New York State Journal of Medicine*, September, 1910.

regular routine, tho supplied with varying interests; together with a simple, moderate diet and regular sleep is most favorable to all cases. It is most difficult, however, if not altogether impossible, to follow this regime outside of an institution.

Epilepsy seems to be almost equally divided between the sexes. Its course is progressive, tending always toward dementia. Its rapidity of progression depends more upon the frequency of the seizures than upon their severity. Excitement, overeating, stimulants, loss of sleep, or irregular hours tend to increase their frequency. There is often a period just preceding, just following, or taking the place of a seizure, during which the patient is violent. He may be destructive of property or may be homicidal or suicidal. Persons at other times most gentle often become maniacal and must be restrained. As no one knows just when these attacks may occur—even tho the individual may never before have exhibited the tendency—it is dangerous to allow the epileptic to live in the community with normal persons. He is a menace on the street, in the home, or in the school. Moreover, his chief characteristic at all times is irritability. This, together with a nature given to suspicion and to falsehood, makes him an unpleasant companion and a blot upon the home life.

The following chart, prepared by Dr. G. G. Kineon³, based on a series of 5,607 cases, shows:

That 25 per cent of epilepsy begins at ages from 1 to 5 years

That 14 per cent of epilepsy begins at ages from 5 to 10 years

That 20 per cent of epilepsy begins at ages from 10 to 15 years

That 5 per cent of epilepsy begins at ages from 25 to 30 years

That 7 per cent of epilepsy begins at ages from 30 to 40 years

Dividing the age of onset into quinquennial periods, we find there are two periods when epilepsy most frequently manifests itself. The first period is from one to five years, in which 25 per cent of 5,607 cases occurred. Since onset is most frequent in the first year of life and continues up to the fifth year, it is possible that its occurrence may bear some relation to the anatomical development of the brain of the child, also to the first and second dentition. The next most frequent age of onset is the period between the ages of ten to fifteen years, the time when puberty with its accompanying changes is established.

³ Superintendent, the Ohio Hospital for Epileptics, Gallipolis, Ohio.

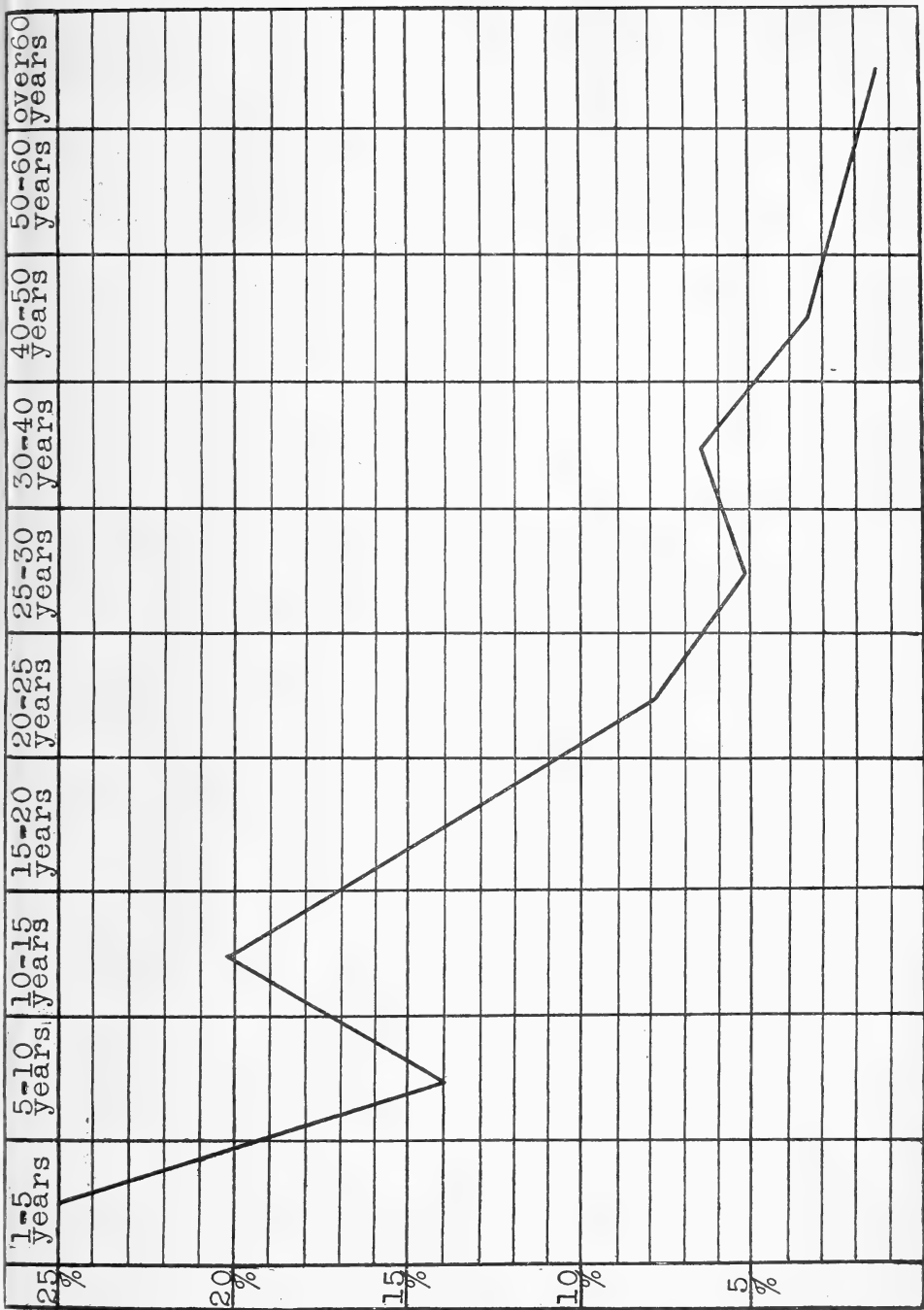


CHART SHOWING AGE AT ONSET OF EPILEPSY, DIVIDED INTO QUINQUENNIAL PERIODS, AND BASED ON A SERIES OF 5,607 CASES.

According to the survey made in 1916, only thirteen states have separate institutions for the care of epileptics and the capacity of these is very small. The accompanying chart, prepared at the Craig Colony for Epileptics at Sonyea, N.Y., for an exhibit made by the Colony at the State Conference of Charities and Correction in 1915, gives an estimate of 200,000 epileptics in the United States. Of this number only $3\frac{1}{2}$ per cent are properly cared for.

N U M B E R O F E P I L E P T I C S
P R O P E R L Y C A R E D F O R I S



13 S T A T E S H A V E C O L O N I E S

The Ohio Hospital at Gallipolis is the oldest and largest. It was established in 1893 and has a capacity of 1,980 persons. This number is said to be only one-fifth of the epileptics in the state. Only two other hospitals, the Massachusetts and New York institutions, have a capacity exceeding 1,000. The Iowa and Illinois institutions are the newest, both having been opened in 1917. The Indiana Village for Epileptics was opened in 1907 with a capacity of 420, accommodations being for males only.

However, the 1919 legislature made an appropriation of more than a quarter of a million dollars for the erection of cottages for women, as well as for enlarging the men's quarters.

Because of the lack of room at the Village for Epileptics, many epileptics will be found in the School for Feeble-minded Youth (which excluded them from admission in 1911), the insane hospitals, the county poor asylums, the state prisons, etc. Table VII gives the situation on September 30, 1916.⁴

TABLE VII. EPILEPTICS IN STATE AND COUNTY INSTITUTIONS

	MALE	FEMALE
State Prison	47	..
Woman's Prison, Correctional Department....	..	2
Indiana Reformatory	17	..
Indiana Girls' School.....	..	4
Indiana State Farm.....	3	..
School for Feeble-minded Youth.....	61	164
Village for Epileptics.....	305	..
Central Hospital for Insane.....	46	52
Northern Hospital for Insane.....	6	27
Eastern Hospital for Insane.....	10	11
Southern Hospital for Insane.....	31	34
Southeastern Hospital for Insane.....	47	43
Marion County Asylum for Insane.....	18	19
County poor asylums.....	56	82
County jails .....	..	2
Orphans' homes	1	2
<hr/>		<hr/>
Grand total	648	442
		<hr/>
		1,090

Table VIII shows classification according to age and sex.

TABLE VIII. CLASSIFICATION ACCORDING TO AGE AND SEX

	OVER SIXTEEN	UNDER SIXTEEN	TOTAL
Males	23	13	36
Females	23	8	31
<hr/>		<hr/>	<hr/>
Total	46	21	67

This shows that 46 or more than two-thirds of the group are over sixteen years of age. According to Dr. Kineon's chart, perhaps 25 per cent of these have had epilepsy since five years of age or earlier and by this time show a marked mental deterioration.

⁴ Report of the Committee on Mental Defectives in Indiana, November 10, 1916, p. 17.

Further investigation shows that 7 of these males and 18 females are married and have a total offspring of 42. One female is recorded as having an illegitimate child. Little is known of these children except 1 who is feeble-minded and 1 who has tuberculosis. However, unless the laws of heredity fail here, many will be found to be epileptic or show other manifestations of mental disorder.

Clara L., now thirty-six years old, is epileptic and syphilitic. Her father, one brother, and one sister died of tuberculosis. She is married and has 4 children. The oldest, a boy, at nine years was in the first grade of school. He has since been placed in a special school, but fails to make progress. He is stunted and undersized. The other children are not yet of school age, but are not noticeably defective and give no history of epilepsy.

Alma P. has been epileptic since eleven years of age. She is now thirty-three, is married to a man with tuberculosis, and has 3 children. Her mother died of tuberculosis and her second child has the disease. All of the children are subnormal mentally, the husband is unable to keep a job, and the family is continually in economic distress.

Fred R. is a widower with 5 children. He is forty-five years old and epileptic. His father is a heavy drinker, and Fred is said to have drunk heavily when young. His wife died of tuberculosis. Nothing is known of the mental or physical condition of the children.

In this group of epileptics there are 3 negro males and 2 foreign-born males, 1 Danish and 1 Syrian. All of the rest are white Americans. The majority of them are living in cities—24 males and 25 females. Only 15, eight males and 7 females, are living in small towns or the country. As has been previously mentioned, country life is much more beneficial to these patients, but few of them can or will have it unless forced to do so.

Carl W. is a colored man of forty years of age who says he has had epilepsy since eighteen. He was born in Kentucky and is one of 18 children. The condition and whereabouts of the other 17 are unknown. He was formerly in an institution for the care of epileptics in another state and now is cared for by a charity organization. He gives a history of ancestral insanity.

Sarah R. is now twenty years of age and as yet unmarried, tho her romances have been many (according to her stories). Her mother died of tuberculosis and an aunt died of epilepsy. Sarah

had typhoid at six, followed by spinal meningitis, after which seizures developed. She is sullen and quiet until crossed, then becomes violent and hard to manage. She is unable to work long in one place, tells many untrue stories, is shrewd and perhaps immoral. She prefers working in hotels, restaurants, or five-and-ten-cent stores where "there are lots of people and excitement". Institutional care for her is greatly desired by her sister, who can no longer control her.

Will G. is a wanderer, age thirty-seven, who claims to have no home nor near relatives. He was born in the city, but lived for many years in a neighboring small town. Tiring of an uneventful life there, he left and has lived in many cities for short periods. He has been a victim of epilepsy since a boy and was recently in a hospital for several weeks suffering from exhaustion following frequent and severe seizures.

The epileptic is unable to compete with his fellows in industry. He is excluded from many trades or kinds of work because of his disease and is unable to hold any kind of job for an extended period of time. This fact alone makes him socially out of adjustment and in need of aid and supervision. Of these 67 persons studied, 31 were known to other social agencies. Only five agencies are mentioned: township trustees, charity organizations, the Children's Aid Association, Public Health Nursing Association, and the Department of School Attendance. There is no record of a court case, altho 1 individual is listed as criminal.

The school history shows that 10 individuals reached the fifth grade or above, 1 was in high school, while 16 did not go beyond the fourth grade. Several were below school age and many were never able to attend school because of physical or mental defect.

There are 6 males and 7 females who are listed as violent; 5 are said to have excessive appetites—a frequent symptom of the disease. This is one of the things which may be discovered by the social worker and will aid the doctor in making diagnosis. It is difficult to get a true account of the number of attacks within a given time, but the records on these patients show 8 having daily seizures, 4 having one seizure a week, 1 having a seizure every two weeks, 1 having a seizure every three weeks, 4 having seizures once a month, and 2 whose seizures are less frequent than once a month.

Anna M. is a child of nine years who became so violent that she is placed temporarily in an insane hospital, pending the erec-

tion of the buildings for females at the Indiana Village for Epileptics. She is very large for her age, being about five feet tall and weighing over one hundred pounds, is cross-eyed and repulsive looking. If opposed in any way, she has violent fits of temper during which she may kick, scratch, bite, or throw anything she can reach, constantly screaming one profane oath after another. She has seizures almost every morning just before rising. She is most ravenous in her appetite, and at one time was seen to eat all of the beans in a big dish which had been prepared for the entire family.

A very small proportion of this group are cared for in institutions. Only 2 males are now in the Indiana Village for Epileptics, altho 3 more applications have been filed. Of the males, 1 is in the Marion County Asylum for Insane, 1 is in the School for Feeble-minded Youth, and 1 is in an orphans' home. Of the females, 2 are in the Marion County Asylum for Insane and 1 application for the Indiana Village for Epileptics is filed. Of those who were formerly inmates of institutions, 4 were in the Indiana Village for Epileptics, 1 was in the Ohio Hospital for Epileptics, 1 was in the Marion County Asylum for Insane, and 2 in Central Hospital for Insane. It would seem that not enough attention has been paid to securing institutional care for these people. Commitment is by court procedure which is tedious and slow, and often working hardship because of this fact, yet it seems a comparatively easy matter for relatives to secure the discharge of these patients and remove them from the institution. If they were permanently improved or cured, it would be all right, but many are recommitted in a short time. It is said "of our epileptics now needing care 23 per cent are in the State Village for Epileptics at Newcastle".⁵ It is hoped that when the new buildings are completed, this percentage may be greatly increased.

All who have at heart the welfare of their neighbors must, in order that those of their fellow-beings of subnormal mentality be properly cared for, do what they can toward arousing in their particular community a proper sentiment for the providing of a means for suitable supervision for this unfortunate class.⁶

Table IX of heredity contains information voluntarily given by the patients. Diseases often associated with epilepsy are included as well as those frequently assigned as its cause. "Relatives" include only grandparents, uncles, aunts, and cousins.

⁵ Second Report of Committee on Mental Defectives in Indiana, March 6, 1919, p. 57.

⁶ Twenty-second Annual Report of Craig Colony for Epileptics, Sonyea, N.Y., 1916, p. 79.

TABLE IX. HEREDITY

Alcoholism in parents.....	13
Tuberculosis in parents.....	6
Tuberculosis in relatives.....	4
Insanity in relatives.....	4
Epilepsy in relatives.....	3
Syphilis in parents.....	3
Nervous disorders in parents.....	3
Epilepsy in parents.....	2
Insanity in parents.....	2
Tuberculosis in brothers or sisters.....	1
Insanity in brothers or sisters.....	1
Epilepsy in brothers or sisters.....	1
Nervous disorders in relatives.....	1
Suicide of father.....	1
<hr/>	
Total	45

Alfred S., now thirty-eight years old and afflicted with epilepsy since thirteen or fourteen, gives an interesting family history. Altho his father, mother, 2 brothers, and 3 sisters are reported free from defect, his mother's family shows ancestral epilepsy and his father's family shows ancestral insanity and tuberculosis. Alfred is married and has one daughter, mental condition unknown. He is said to drink heavily.

Patients or their families often tell of the supposed cause of their epilepsy, outside of hereditary factors. Many times they may give the true cause, but often what seems to be the cause and result may be only a sequence of events. Table X gives a list of causes given.

TABLE X. CAUSES AS GIVEN BY PATIENT OR HIS FAMILY

Spinal meningitis	4
Injury	4
Scarlet fever	2
Paralysis	2
Typhoid fever	1
Typhoid pneumonia	1
Whooping cough	1
Brain tumor	1
<hr/>	
Total	16

Disorders accompanying epilepsy as given on the records of these patients are shown in Table XI.

TABLE XI. ACCOMPANYING DISORDERS

	MALE	FEMALE	TOTAL
Venereal disease	3	6	9
Feeble-minded	4	3	7
Alcoholism	5	2	7
Tuberculosis	1	1	2

Henry H., age thirty, is said to have developed epilepsy following an attack of scarlet fever at twelve years. He became very melancholy and began to drink. Seizures always followed intoxication. He was an inmate of Central Hospital for Insane three times, where he was reported destructive and profane. The family history shows insanity on the maternal side.

A questionnaire was sent out to each of the state institutions for the care of epileptics and in every case heredity was assigned as the greatest cause of the disease, and epilepsy with its natural sequelae as the greatest cause of death among the patients. The average age of death of epileptics is given as thirty years.⁷ Altho medically, the cure for epilepsy may not be found, socially, prevention seems to be the cure. A few suggestions as to how to prevent epilepsy follow: (1) better parents (clean heredity, clean people), (2) better obstetrics, (3) hygienic environment (in childhood), (4) control of common infectious diseases, (5) restriction of alcohol and venereal disease, (6) prevention of accidents.

Surely such a program would be endorsed by all socially-minded individuals. A special appeal is made to the trained social worker.

The importance of having available at all times a trained person who could go into various parts of the state to ascertain facts relative to the family and personal history of our patients would be of the utmost value from a scientific standpoint. Such a person could also be of much assistance in disseminating in various communities proper ideas regarding defectiveness and common-sense means of endeavoring to control its increase.⁸

⁷ Statistics from Craig Colony for Epileptics, Sonyea, N.Y.

⁸ Twenty-second Annual Report of the Craig Colony for Epileptics, Sonyea, N.Y., 1916, p. 79.

IV. THE INSANE

A brief and concise definition and explanation of insanity will be found in the following quotation:

An insane person is one incapacitated as the result of a mental disease. Such disease usually results from other disease or injury of the brain and nervous system, yet sometimes has its origin in diseases of the more remote organs of the body. It is a disease of adult life and with few exceptions develops at or after the period of adolescence. Many cases of insanity are plainly hereditary in nature and are the result of the breaking down of a transmitted susceptible mental and nervous organization. It is curable or incurable, depending upon the form, the cause, individual development of the person affected, and early treatment. The vast majority of cases are preventable.¹

The insane used for this study include those suffering from functional mental disorders as well as those having organic mental disease, for the social problems of each must be considered. It must first be remembered that mental sickness even in its mildest forms is far worse than physical illness and is often more torturing. It is a mistake to believe that the insane do not realize their condition. Most of them, unless completely demented, know that their minds are not normal and they suffer anguish over this knowledge.

For the past fifty years the public has been educated in Indiana regarding care for the insane, until at present it is estimated that 79 per cent of those now needing care are in hospitals for the purpose.² Segregation under state supervision unquestionably is the best method of care and prevention. **However, the** difficulty is in the manifold manifestations of the diseased brain, making early diagnosis difficult. The border-line between the sane and the insane is very obscure, so that often the case is not recognized nor seriously regarded until a dangerous period has been reached. It is usually not until this time that expert medical advice is sought. Further public education is needed for early recognition of mental disorder, that curable cases may be cared for before it is too late.

The United States census for 1910 gives an enumeration of 187,791 insane persons in 366 institutions. "The annual cost of the burden of insanity alone, computed at the conservative esti-

¹Second Report of the Committee on Mental Defectives in Indiana, March 6, 1919.

²*Ibid.*, p. 57.

mate of \$175 per capita of insane in institutions in 1910, would amount to \$32,863,425 in all the states of the Union."³ This financial statement, however impressive, cannot compare with the cost of the loss of human efficiency, its attendant crime, pauperism, and immorality. Prevention is the slogan of the social worker. Often, in her visits to patients' homes, she will recognize cases of mental disorder which have never had medical care and advice and may secure it for them.

I firmly believe that any well organized system of social service, having for its chief object the prevention of nervous and mental disorders in the community, cannot fail in time to prevent the occurrence of a majority of the preventable cases which develop each year, but which, today, through ignorance or neglect, are permitted to reach a stage where commitment is necessary and cure so difficult or impossible.⁴

True insanity is due to organic disease, which brings about a breaking down of the nerve cells. In some forms the disease which is the cause has been determined, while in others, the disease, altho believed to be present, has not been demonstrated. Insanity is not directly inherited, yet the instability of the nervous system, the predisposition to mental disorders, seems to be hereditary. If it is believed that the body is the instrument of the mind, then health of the body is the prerequisite for mental health.

"The writers of the Bible evidently considered that a healthy body is an important asset, not only in itself, but for the relation it bears to mind and spirit or as the foundation of the whole personality."⁵ Some of the diseases resulting in insanity may attack the body in spite of careful living, but usually broken rules of hygiene are the cause. Dr. H. C. Eyman says: "The two overwhelming factors are heredity and dissipation, the latter including intemperance in drinks or drugs, and venereal disease. If these two great causes could be removed insanity would be rare indeed."⁶ Surely, if this were generally known and its truth fully appreciated, the work of prevention would be partially accomplished. A more general adoption of the eugenic program, together with abstinence from dissipating indulgences, would serve to check the preventable forms of insanity.

³ Owen Copp, M.D., "Mental Disease and Mental Defect, A State and National Problem", *Feeble-mindedness and Insanity*, p. 268.

⁴ Clifford W. Beers, *The Value of Social Service as an Agency in the Prevention of Nervous and Mental Disorders*, p. 3.

⁵ Dr. H. C. Eyman, Superintendent of the Masillon (Ohio) State Hospital, *The Greatest Problem of the Race—Its Own Conservation*, chap. viii, p. 113.

⁶ Professor Rudolph M. Binder, Ph.D., "The Significance of Health", *Studies in Social Progress*, Vol. X, No. 9, June, 1918, p. 129.

Martha C., now an inmate of an insane hospital, is a high school graduate and also a graduate nurse. She is alcoholic and insane because of syphilis. Her father died of paralysis; her mother had hysteria; one brother died of paresis in an insane hospital; and one sister has a son who is an imbecile.

Margaret H., age forty, was committed to an insane hospital with a diagnosis of manic-depressive psychosis. She was paroled after four months and later discharged. Soon after this she married a wealthy farmer and her subsequent history is unrecorded. However, her family history shows an insane mother, a brother with dementia praecox now held in an institution, and a cousin who is insane.

Lula L. was forty-eight years old when she was first brought to the City Dispensary. She was insane due to syphilis, and had attempted suicide because her husband threatened to place her in an institution. Her husband is alcoholic and their 3 children are incorrigible. One son was sent by Juvenile Court to the Indiana Boys' School and the other 2 children were also sent to correctional institutions.

Psychoses, not true insanity, are the functional disturbances psychic in origin, which may be brought about by external causes, where there is an unstable nervous make-up. These include hysteria and neurasthenia. The "war neuroses" mentioned in Chapter I belong to this group. The prognosis in these cases is usually good; the treatment consists largely in psychoanalysis to discover the idea which is the cause of the patient's illness, and the introduction of a new and opposing idea in its place. Often a change of environment is necessary to prevent a return to the morbid mental attitude. Of hysterical insanity Dr. Kraepelin says: "It is the expression of a peculiar, morbid tendency, and can be brought to further development, but not originated, by external causes."⁷

Heredity then is the inciting cause, and prevention must begin with the preceding generation. However, since improvement, if not complete cure, can be brought about in the majority of these cases thru proper treatment under expert medical advice, the outlook is encouraging. Social workers, as friends of the patients who may receive their confidence, can be of service to the alienist, first, in discovering the etiology of the patient's condition; and, secondly, in bringing about such environmental changes as may

⁷ Dr. Emil Kraepelin, *Clinical Psychiatry*, p. 253.

be deemed advisable. The psychoses with their numerous manifestations and capricious nature are very prevalent and contribute largely to social maladjustment. Unusual or unnatural emotional conditions extended over a period of time produce irritability and loss of self-control. There are often physical symptoms in disorderly action of the heart, tremors, loss of flesh, hearing, or speech.

The idea of illness and its possible consequences obsesses most neurasthenics. In many cases the idea that they will never recover becomes fixed and has a baneful effect on the progress which should be made—misplaced sympathy and unintelligent nursing frequently result in the manufacture of severe cases.⁸

The patient should have the confident assurance of recovery by all with whom he comes in contact. It must be remembered that he has an exaggerated, abnormal mental outlook and he needs the stimulating effects of common sense and a healthy, normal environment. Colonel Collie says: "Personally, I have always believed that hard and continuous work is the only way to be really happy, and that work in one form or another is the only salvation for those who are suffering from functional nerve disease."⁹

George M., a neurasthenic of forty-five years of age, believed that he had tuberculosis. He was carefully examined and found free from the disease. However, he could not be persuaded that he was able to return to work. He was given relief by various social organizations, who also believed him unable to work, and frequently returned to the doctor with some new pain. Finally, convinced that the doctor was wrong, and that his tuberculosis was real, he secured money from relatives and went west to seek health.

Edith C., the mother of 5 children, has had hysteria with a loss of voice, often lasting five weeks, after the birth of each child. She recovers each time, takes care of her household duties, and shows no symptoms except a noticeable nervousness until the time of her next delivery.

Bert H. is the father of 6 children, 1 of whom is a cretin. An uncle died in an insane hospital. Bert had spinal meningitis and typhoid fever twice. He suffered from sleeplessness and

⁸ Colonel Sir John Collie, M.D., A.M.S., "The Management of War Neuroses and Allied Disorders in the Army", *Mental Hygiene*, Vol. II, 1918, p. 4.

⁹*Ibid.*, p. 10.

developed a fear neurosis. However, under medical care and social supervision he improved, returned to his work which he had abandoned, and resumed the support of his family. No recurrence has yet been reported.

Jake W., a Russian Jew, twenty-two years old, claims to have been well all his life until he received news of his father's death in Russia. He then had an "attack" of hysteria, followed by a persistent death fear. He was unable to work, very morbid, and unhappy. Fortunately for him, his wife became ill at this time, making it obligatory for him to return to work, and his improvement began immediately.

Miscellaneous mental and nervous disorders include chorea, thyroid disturbances, drug addiction, and the many forms of nervousness not insanity which make for an unbalanced mentality, stammering, deafness, paralysis, etc. Disorders due to injury, affecting the nervous system, are also included in this group. In some instances, the symptoms may be only the initial stages of true insanity, as yet undiagnosed. From the social viewpoint the important thing is that these patients are mentally abnormal, whether it be temporarily or permanently. They need first of all a complete diagnosis, then treatment in accordance with it. Here will be found many of the "preventable" forms often unrecognized by the layman as mental sickness. Each of these disorders will be discussed later in connection with patients studied.

Florence R. is a little girl nine years old who is unable to attend school because of chorea. She has had repeated attacks of tonsilitis, followed by rheumatism previous to the chorea. Her tonsils have been removed, but her nervous condition has not yet subsided. The doctor has advised rest in bed and her mother has tried to follow the treatment, but there are many stormy and tearful protests from Florence, with the result that she does not remain in bed long. She is bright, loves to read, and is anxious to return to school, but is irritable and cross and in a pitiful physical and mental condition.

Alice C., age thirty-five, is addicted to the use of alcohol and morphine. Her mother was said to have been mentally unbalanced. Alice is married, her husband now serving sentence in the penitentiary for petit larceny. She was at one time sent to the Woman's Prison for being one of a party in a drunken row.

Mary V. has an excessive fear of everyone. She ran away from home at one time because of this fear. It is rumored that

she killed her first husband in order to marry her second. She has thyroid trouble and was at one time in an insane hospital for two months.

Vernon S. received a dog bite for which he came to the city to take Pasteur treatment. He was noticed to have a staggering walk and tabes was suspected. He was sent to the hospital to secure diagnosis and was found to have hereditary ataxia. His condition grew rapidly worse and was considered hopeless.

Table XII gives an account of the cases used in this study of the insane classified according to diagnosis. The preponderance of females, especially in the group of psychoses, not true insanity, will be noted. It will also be noticed that the largest number fall under the classification of miscellaneous mental and nervous disorders. This is perhaps mainly due to insufficient diagnosis, as has been mentioned elsewhere. These individuals form the great number of "border-line" cases seldom cared for institutionally, who are unmolested in the community until by some overt act they step over into the realm of the truly insane.

TABLE XII. THE INSANE—CLASSIFICATION BY DIAGNOSIS

	MALES	FEMALES	TOTAL
True insanity	19	28	47
Psychoses, not true insanity.....	11	31	42
Miscellaneous mental and nervous disorders	34	55	89
Total	64	114	178

Most of the 47 cases of true insanity in the first group of the insane are white Americans, but there are 2 negro males, 1 German male, and 3 German females. It is interesting to note that the 4 foreigners all come from Germany, the country noted for its insane.

TABLE XIII. TRUE INSANITY—CLASSIFICATION BY AGE AND SEX

	OVER SIXTEEN	UNDER SIXTEEN	TOTAL
Males	19	..	19
Females	26	2	28
Total	45	2	47

Table XIV shows the civil state of these patients. The results of the marriages are 68 children. There are 2 illegitimates recorded. There is little history of these children, but the following examples are suggestive: "one epileptic daughter; one son

paralyzed; one child feeble-minded; one son in Central Insane Hospital; three boys incorrigible; one child died of brain fever”.

TABLE XIV. TRUE INSANITY—CLASSIFICATION ACCORDING TO CIVIL STATE

	MARRIED	SINGLE	TOTAL
Males	13	6	19
Females	20	8	28
	—	—	—
Total	33	14	47

The number now cared for in institutions is small, numbering 4 males and 13 females. Of those formerly in institutions, there are 7 males and 6 females. The great number of recommitments among these patients is a serious waste. Many have been returned three or four times to the same institutions. Altho they are usually withdrawn upon the urgent insistence of the family, all too often they are released by the institution which because of insufficient knowledge of the family situation, assumes that recovery may continue at home. Follow-up work after a patient's discharge and close supervision are necessary in almost every case, to prevent a back-sliding into the former condition. A return to life in the community is desirable when warranted by the patient's condition, but these incurable cases whose periods of improvement are transitory and short would seem better off and safer to the community if held within the institution.

Lucy G., age thirty-four years, is married and has 5 children. She has paranoia and was formerly in an insane hospital for more than a year. She has recently become so violent, her mania being to burn and destroy, that her husband has again sent her to an insane hospital. Her brother is also insane.

Flora M. was sent to the hospital because of ear trouble and enlarged glands of the neck. It was found that she was syphilitic and insane. She caused trouble in the wards and threatened suicide. Shortly after her discharge she was committed to an insane hospital. She was discharged on furlough after two months, recommitted and held four months, and discharged again. She then married and moved to another section of the country. What her history has been since her marriage is unknown.

Lida M., age thirty-seven, gives the following family history: her father was said to be very nervous; one aunt is in an insane hospital; a brother died in a spasm; one sister is in the Indiana School for Feeble-minded Youth. The patient's institutional history is interesting. Her first commitment to an insane hospital

was from January, 1895, until August, 1895. She was recommitted October, 1899, until July, 1900; again recommitted September, 1902, until May, 1903; again recommitted March, 1910, until May, 1913; again recommitted in 1917. She has manic-depressive psychosis.

Other social agencies were interested in 23 of these 47 patients, providing financial aid, lodging, care for children, or court supervision. Of the school history little is known, except that most of these individuals finished the fifth grade and several had reached high school.

In classification of this group according to the causes of their condition (Table XV) there are two great divisions: those insane due to syphilis, and those insane due to all other causes. Seven have died since recorded.

TABLE XV. TRUE INSANITY—CLASSIFICATION BY DIAGNOSES

<i>a. Syphilitic Infection</i>						
	PARESIS	TABES	LOCOMOTOR ATAXIA	CEREBRAL PALSY	TOTAL	
Males	8	3	1	..	12	
Females	7	1	..	1	9	
	—	—	—	—	—	
Total	15	4	1	1	21	

<i>b. All other causes</i>						
	MANIC DEPRESSIVE PSYCHOSIS	DEMENTIA PRAECOX	BRAIN TUMOR	PARANOIA	INCOMPLETE DEMENTIA	TOTAL
Males .....	..	3	..	2	..	7
Females	8	2	2	..	1	19
	—	—	—	—	—	—
Total	8	5	2	2	1	26

Accompanying diseases and disorders are found to be as follows: tuberculosis in 4 instances; deafness in 3; epilepsy, spinal trouble, Bright's disease, morphinism, cataract, alcoholism, etc., and others.

William B., now nearly blind and insane because of syphilis, had two brothers who committed suicide. He has been married twice and has had 7 children. One of these children is now in an insane hospital, 1 died of brain fever, and 2 died of tuberculosis.

Pearl T. at fifteen years of age became insane and was sent to an institution. She has dementia praecox and is apathetic, mute, and shows marked mental deterioration. She attended school until fourteen years old, but was dull in her studies. Her father committed suicide.

Elsa H. was known for a long time to be mentally unbalanced and very deaf, but complete diagnosis was never made nor institutional care provided. However, her daughter, epileptic and violent, was committed to an insane hospital. At the patient's death, due to pneumonia, autopsy revealed a brain tumor.

A study of the heredity of these patients is shown in Table XVI.

TABLE XVI. TRUE INSANITY—HEREDITY

Nervous disorders in parents.....	6
Insanity in parents.....	3
Insanity in brothers or sisters.....	3
Insanity in relatives ¹⁰	3
Nervous disorders in brothers or sisters.....	3
Feeble-mindedness in brothers or sisters.....	2
Feeble-mindedness in relatives.....	2
Suicidal brothers	2
Alcoholism in parents.....	2
Tuberculosis in parents.....	2
Tuberculosis in brothers or sisters.....	2
Tuberculosis in relatives.....	2
Epilepsy in parents.....	1
Epilepsy in brothers or sisters.....	1
Deafness in parents.....	1
Feeble-mindedness in parents.....	1
Suicidal father	1
Suicidal relative	1
Nervous disorders in relatives.....	1
Total	39

Grace C., now in an insane hospital with a diagnosis of dementia praecox, is said to have shown first symptoms at eighteen years of age. However, she gave birth to an illegitimate baby when sixteen years old and is reported to have had a psychosis following typhoid fever when she was a child. Her father is alcoholic, her cousin was a suicide, and an aunt was insane.

Lilly H., age twenty-three years, sent to the hospital for tonsillectomy, was difficult to control or keep in bed and was discovered to be insane. Her father and mother are reported mentally subnormal and a brother and sister who are twins are imbeciles.

The second group of the insane (Table XVII), those who have psychoses not true insanity, is made up of 42 individuals, all over sixteen years of age except 1 female who is fourteen. There are 2 negro females, 2 foreign-born females, and 1 foreign-born

¹⁰ Relatives include only uncles, aunts, cousins, or grandparents.

male. Of the foreign-born 2 are Russian Jews and 1 is Greek. All of the others are white Americans.

TABLE XVII. PSYCHOSES NOT TRUE INSANITY—
CLASSIFICATION BY AGE AND SEX

	OVER SIXTEEN	UNDER SIXTEEN	TOTAL
Males	11	..	11
Females	30	1	31
	—	—	—
Total	41	1	42

Of these 42 persons, 32 are married (Table XVIII). The records show 42 children, 1 of whom is illegitimate. Most of these children are still very young and their mental condition has not been ascertained. However, one record shows a mother whose hysteria followed the death of her small child by accidental poisoning; later, a daughter of this patient was a witness to a shooting incident in which a man was killed, and developed hysteria.

TABLE XVIII. PSYCHOSES NOT TRUE INSANITY—
CLASSIFICATION ACCORDING TO CIVIL STATE

	MARRIED	SINGLE	TOTAL
Males	9	2	11
Females	23	18	31
	—	—	—
Total	32	20	42

As a rule institutional care is neither necessary nor advisable for these patients. As has been mentioned before, a return to work, common-sense handling, and a healthy environment furnish the quickest cure. However, where there is a bad physical condition and great exhaustion, hospital care and a return to physical vigor are necessary before a change of mental attitude can be expected. None of the persons used for this study has had institutional care.

Of this group, 23 are city residents, the other 19 living in towns or in the country. Since the mental disturbance arises from causes within the individual, external factors being of only secondary importance, the place of residence must not be stressed too greatly. City life naturally brings about more nervous strain and fatigue, and for the persons of nervous instability is less desirable than the more quiet suburban life. However, the person of normal, strong nerves is not apt to develop a psychosis even under the greatest strains of urban life, while the person of an

unstable nervous make-up may break when leading a quiet country life.

Other social agencies, mostly those giving relief, have been interested in 24 of these patients. Often, not realizing the nature of the disease, these organizations harm the patient and postpone his cure by their aid. It is no wonder that disorders which baffle many general practitioners of medicine are not recognized and properly interpreted by social workers. This only emphasizes the need of securing expert medical attention for all cases.

That those who have psychoses usually have a rather high grade mentality is illustrated by this group, in which nearly all had completed the fifth grade of school, several finished high school, and one had gone a year to college. Because of their intelligence, they can bring about their own cure under proper supervision, by an understanding of the cause of the difficulty and a real desire to overcome it.

According to diagnosis, this group falls into two divisions: those who have hysteria, and those who have neurasthenia. This nomenclature is said to be inexact and indefinite in its scientific meaning, leading often to confusion. However, the diagnosis of hysteria here means those individuals having striking physical manifestations of functional nervous disorder such as paralysis, convulsive seizures, anaesthesia, etc. Neurasthenia means the cases showing mental manifestations of exhaustion, obsessions, phobias, etc.

Table XIX shows a classification by diagnoses.

TABLE XIX. PSYCHOSES NOT TRUE INSANITY—
CLASSIFICATION BY DIAGNOSIS

	NEURASTHENIA	HYSTERIA	TOTAL
Males	9	2	11
Females	15	16	31
	—	—	—
Total	24	18	42

Jean C., a girl of sixteen, was brought to Juvenile Court charged with delinquency. She became very excited and lost her voice in an hysterical attack. Her history showed that she had run away from home to escape a cruel father. Whenever she became excited, she again lost her voice, and this condition subsided only after Jean married and went to a home of her own.

Dora G. is a Russian Jewess of twenty-four years, a tailoress by trade, who developed neurasthenia following a pelvic operation.

She had been a very hard worker and was in need of a vacation or change of employment. A disappointing love affair added to her troubles and perhaps was the inciting cause of her psychosis.

Traumatic cases, usually developing after some slight injury or accident, present symptoms of hysteria or of neurasthenia. Usually such cases show no improvement until the payment of damages or compensation. Factory owners and railroad officials have learned that it is cheaper to settle promptly than to pay for extended hospital and doctor's care.

Carl B. was jerked over a machine and strained his back in an accident in the factory where he was employed. His injury, tho painful, was not serious. However, he developed neurasthenia and believed that he would never again be able to work. After the payment of one thousand dollars damages, his improvement was steady and he returned to the factory to work.

Because of the difficulty in securing information from this group, the study of their heredity (Table XX) is very incomplete.

TABLE XX. PSYCHOSES NOT TRUE INSANITY—HEREDITY

Nervous disorders in parents.....	3
Nervous disorders in brothers or sisters.....	3
Alcoholism in parents.....	2
Tuberculosis in brothers or sisters.....	2
Insanity in sister.....	1
Insanity in relatives.....	1
Nervous disorders in relatives.....	1
	—
Total	13

The third group of the insane, those who have miscellaneous mental and nervous disorders, is comprised of 89 individuals (Table XXI).

TABLE XXI. MISCELLANEOUS MENTAL AND NERVOUS DISORDERS—CLASSIFICATION BY AGE AND SEX

	OVER SIXTEEN	UNDER SIXTEEN	TOTAL
Males	19	15	34
Females	41	14	55
	—	—	—
Total	60	29	89

In this group there are 2 negro males and 2 negro females; 3 foreign-born females; all of the rest are white Americans. Of the foreign-born, 1 is Austrian, 1 German Jewish, and 1 Irish. Only 38, 28 females and 10 males, are married. The records show

65 children. Of these 4 are known to be feeble-minded; 1 is epileptic; 2 have nervous disorders.

TABLE XXII. MISCELLANEOUS MENTAL AND NERVOUS DISORDERS—CLASSIFICATION ACCORDING TO CIVIL STATE.

	MARRIED	SINGLE	TOTAL
Males	10	24	34
Females	28	27	55
Total	38	51	89

Only 2 patients in this group have had institutional care and these are at present in insane hospitals. One is a drug addict and the other has Huntington's chorea. Of the others, 64 are city residents and 23 are town or country residents.

The diagnoses of this group are as follows: chorea, thyroid disturbances, drug addiction, and all other nervous disturbances having mental manifestations but neither true insanity nor psychoses. Table XXIII shows a classification of this group by diagnosis.

TABLE XXIII. MISCELLANEOUS MENTAL AND NERVOUS DISORDERS—CLASSIFICATION BY DIAGNOSIS

	CHOREA	THYROID	DRUGS	OTHER DISORDERS	TOTAL
Males	8	..	6	20	34
Females	14	5	16	20	55
Total	22	5	22	40	89

Hazel E. was brought to the dispensary when eleven years old with typical symptoms of Sydenham's chorea in a severe form. Her father had had chorea when a child and her sister had the same disease a year ago. Hazel was put to bed at home, but was so difficult to manage that her parents were soon persuaded to send her to the hospital. After two months she was greatly improved and was discharged. However, in five months she was again sent to the hospital in almost as bad a condition as at first. She again improved and was discharged after two and a half months. This time, with more careful supervision of her home life, her improvement was progressive and she returned to school and has regained her normal health.

Kate B., age thirty-four years, has Huntington's chorea. One brother is in an insane hospital with dementia praecox; a sister who had the same disease died there. Kate's father is said to

have had chorea and her mother's brother is an epileptic; her daughter stammers. This family history shows plainly the heritability of nervous instability and argues for the prevention of the propagation of a tainted stock.

Alma R. was operated on for goitre and afterward suffered mental manifestations. She developed mania for medical attention and dwelt constantly on her symptoms. She lost weight and physical vigor and was easily exhausted. She became a great care to a widowed sister. This patient had formerly had sufficient money to live comfortably, was well educated, and had traveled in Europe. Financial reverses reduced her to poverty and dependence on relatives.

Jane R., age thirty years, began the use of morphia twelve years ago. It was prescribed following a pelvic operation and the habit thus formed. She was sent to the hospital for cure and at that time had been taking ten to twelve grains a day. Her mind was greatly disordered. Her family is mentally subnormal and her father is a heavy drinker.

William D., age forty-two years, jumped off a train and suffered head injury. Partial paralysis and mental derangement resulted. He was brought to the hospital and surgical care considered but deemed inadvisable. His condition is considered hopeless.

Sallie C. is a sexual pervert, irresponsible and immoral. She has nervous spells during which her right side twitches and jerks. Her brother with whom she lives is unable to control her and she is given to lying and stealing. She is intelligent, having reached the third year of high school, and very shrewd.

Clara P., a colored woman of forty-eight years, was married at sixteen and had 12 children. At twenty-eight she had spinal meningitis and was ill for three months. Six years ago she was stricken blind for three days and lost the use of her limbs. She suffered severe pain in her back. At her death, autopsy disclosed tumor on the spinal cord.

Gail H., a child of eight years, has a vaso-motor disturbance which extends to the brain. She is stupid, but not defective and should be gently dealt with. She is extremely nervous and difficult to handle. Gail's sister is insane.

Table XXIV shows the heredity of this group.

TABLE XXIV. MISCELLANEOUS MENTAL AND NERVOUS DISORDERS—HEREDITY

Tuberculosis in parents.....	8
Syphilis in parents.....	8
Tuberculosis in relatives.....	6
Insanity in parents.....	5
Insanity in brothers or sisters.....	4
Feeble-mindedness in brothers or sisters.....	4
Nervous disorders in relatives.....	4
Alcoholism in parents.....	4
Nervous disorders in parents.....	3
Epilepsy in relatives.....	2
Tuberculosis in brothers or sisters.....	2
Nervous disorders in brothers or sisters.....	1
Feeble-mindedness in parents.....	1
Insanity in relatives.....	1
Suicidal father	1
Total	54

Social work among these patients is not only more necessary than among almost any other group, but its fruits are more clearly seen and pointed out. There is opportunity for preventive measures in watching the younger members of families known to be unstable, securing for them medical advice and care, aiding them in finding suitable employment, educating them along lines of mental hygiene. There is after-care to be given those recently discharged from hospitals or institutions. Only by the strictest supervision of home and industrial life and education of the entire family and the care of these patients can they be kept from becoming "repeaters". Enactment of laws committing incurables to institutions for life, and proper supervision and care for those in the community suffering from temporary mental disorders make for social control of these diseases and aid in stamping them out. Fortunately, the problem of the insane has been worked out better than some of the other social problems, but there is yet much to be learned and no one should be content with the present accomplishments.

CONCLUSION

MENTAL disease and defect is a social as well as a medical problem. Because it is so widespread thruout the country, embracing all classes, a more general knowledge of its cause and effect in its social aspects is desirable. The social worker, who almost daily is brought in contact with cases of mental disorder, can be an efficient aid in the work of prevention and cure. However, the small group of physicians and social workers alone cannot cope with this great problem with satisfying results. An intelligent public which understands some of the fundamental principles underlying the social maladjustment of the mentally diseased and defective is necessary to the establishment of social control over them.

The feeble-minded are anti-socially reason of their deficiency. Economically, they represent a large portion of the pauper class receiving public relief. They contribute to criminality mostly by accumulation of petty crimes and offenses frequently repeated, regardless of punishment. Lacking in initiative and unable to foresee the logical results of their acts, they easily fall prey to the shrewd expert who uses them for his tools. Morally, lacking the inhibiting forces of mind and will and governed only by their coarser appetites, they fall victims of vice and continue to lead its life. In school, unable to keep up with their normal fellows, they lose interest and become discouraged. They are a retarding influence to the other pupils. Placed in special schools, where they may learn manual tasks and have more freedom and individual attention, their interest is awakened and useful training is given.

It is the high-grade feeble-minded, moron, who is social menace and should have institutional care for life. The lower grades, tho entirely useless members of society, seldom propagate themselves, and their number would decrease if procreation of the morons were prevented. The colony plan for care of these subnormal persons, whereby they may receive useful training and take part in their community life within the colony under careful supervision, is generally advocated. With adequate institutions in each state, in one generation a large part of the feeble-mindedness would be stamped out. However, in 1916 there were sixteen states having no public institutions for the care of the feeble-minded, and the existing institutions in other states were

caring for only a small proportion of the defective population. Because of this fact, an effort must be made to secure supervision of these individuals in their homes to prevent the evil consequences which have been mentioned, all the while educating public opinion toward legislative action.

"No group of people is more definitely handicapped in the efforts of maintaining existence than is the epileptic."¹ Thus the epileptic, potentially at least, belongs to the pauper class, and must be cared for by society. Without warning, his physical and mental processes are stopped for varying periods of time. During these periods, or preceding or following them, he may be temporarily insane and hence violent and irresponsible. His mental enfeeblement is progressive and dementia is the inevitable result unless he meets an early death.

Since the cause and remedy of this disease is as yet undetermined by medical science, a definite social program is difficult to formulate. However, the epileptic is incompetent, physically and mentally, for life in society. Heredity is believed to play a large part in causing the disease. This, together with the fact of the peculiar mental make-up of the epileptic, making him difficult to restrain and given to criminal and immoral tendencies, makes institutional care for him advisable. Society will thus be protected from him and his potentially defective offspring and he will be enabled to receive constant expert medical attention and to lead, as far as possible, a useful life, free from responsibility and best suited to his well-being. Until such time as adequate institutional care in farm colonies, which thus far have been deemed most suitable, can be provided for these individuals, society must provide means for their care and protection in the community.

The insane have received more attention from the layman than the feeble-minded or the epileptic and more adequate provision for their care has been made. Altho this is praiseworthy as far as it goes, the questions of prevention and of after-care have been neglected. Many forms of insanity are wholly or partially preventable and many times recurrences of disorders are preventable. Early recognition of the disordered mind and the securing of expert medical attention are the first steps toward cure. However, prevention must go back of the individual to his forebears in a majority of cases. The inheritance of an

¹ R. L. Dixon, M.D., *The Epileptic's Social Status*, p. 3.

unstable mental and nervous make-up makes fertile soil for the implanting of bad habits of life and their consequence of disease. Persons of mental instability, then, should not be allowed to participate in the propagation of the race.

Education of the public regarding the causes of the preventable forms of insanity—as alcoholic and drug psychoses and general paralysis—should result in their gradual elimination. Here again, early recognition and care, now omitted thru ignorance and neglect, constitute a means of prevention. Among those discharged from insane hospitals as cured or improved, there is need for home supervision and education along lines of mental hygiene, both for the patient and his family, that he may learn to live within his limit of resistance to mental disorder. Public enlightenment regarding the insane should result in a successful combating of the unfounded fears and prejudices regarding the institutions for their care.

Criminality and its relationship to insanity, epilepsy, and feeble-mindedness is the subject of many discussions today. Mr. Davenport says: "The question whether a given person is a case for the penitentiary or the hospital is not primarily a legal question but one for a physician with the aid of a student of heredity and family histories."² It has been suggested that much time and money would be saved and many legal entanglements avoided, if every person convicted of crime could be examined by a "jury of neurologists" before appearing before a jury of laymen.³ Perhaps better methods of punishment and control might also result from such a procedure.

It is a reproach to our intelligence that we as a people, proud in other respects of our control of nature, should have to support about half a million insane, feeble-minded, epileptic, blind and deaf, eighty thousand prisoners and one hundred thousand paupers at a cost of over one hundred million dollars per year. A new plague that rendered 4 per cent of our population, chiefly at the most productive age, not merely incompetent but a burden costing one hundred million dollars yearly to support, would instantly attract universal attention. But we have become so used to crime, disease and degeneracy that we take them as necessary evils. That they were so in the world's ignorance is granted; that they must remain so is denied.⁴

² Charles B. Davenport, *Heredity in Relation to Eugenics*, p. 92.

³ Dr. Charles D. Humes, Indianapolis.

⁴ Charles Benedict Davenport, *Heredity in Relation to Eugenics*, p. 4.

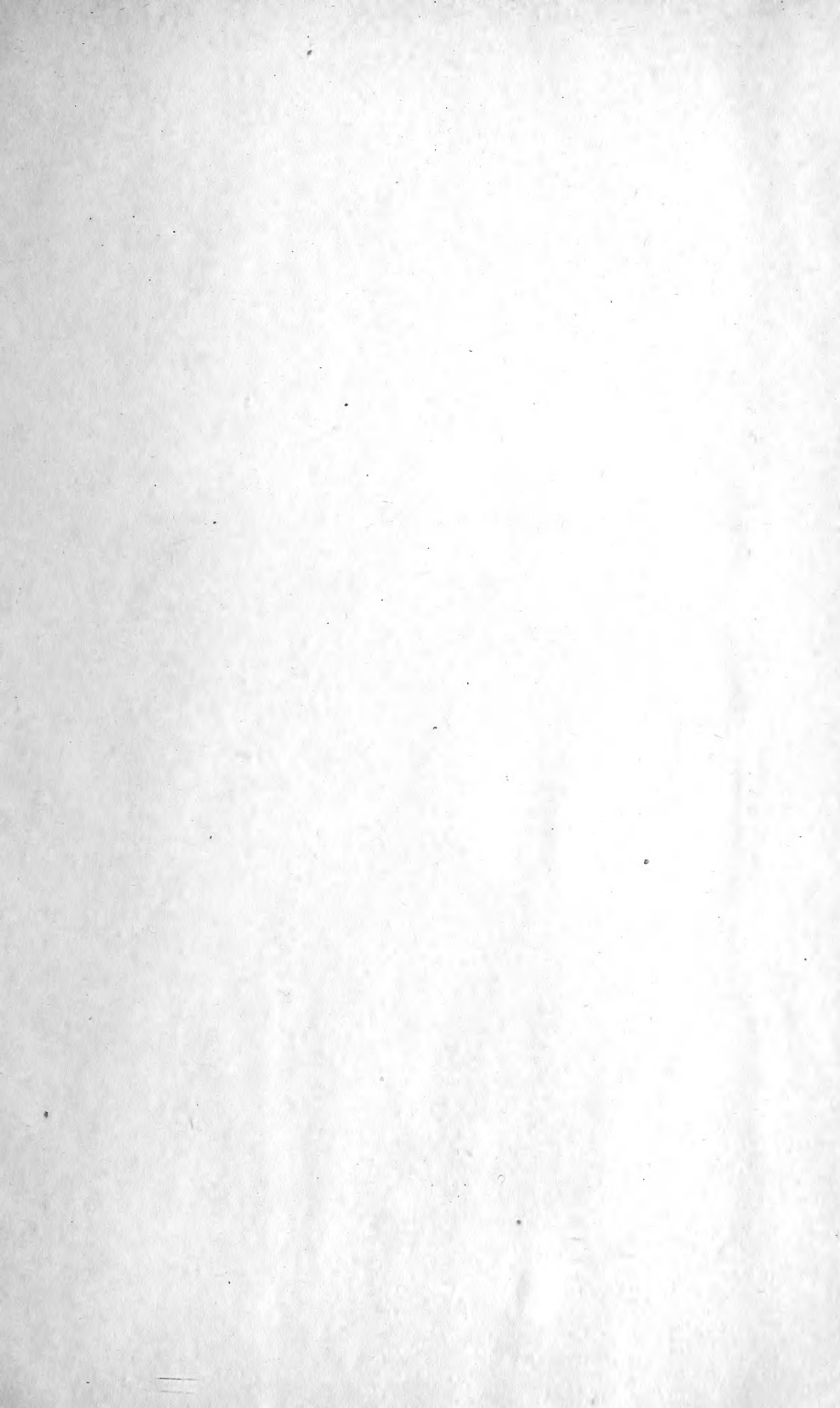
With newly aroused social consciences thru a participation in the great struggle to make the world "safe for democracy", the American people can and must turn their attention to making the world safe for humanity. Surely one of the first steps in this program will be the elimination, as far as possible, of mental disease and defect.

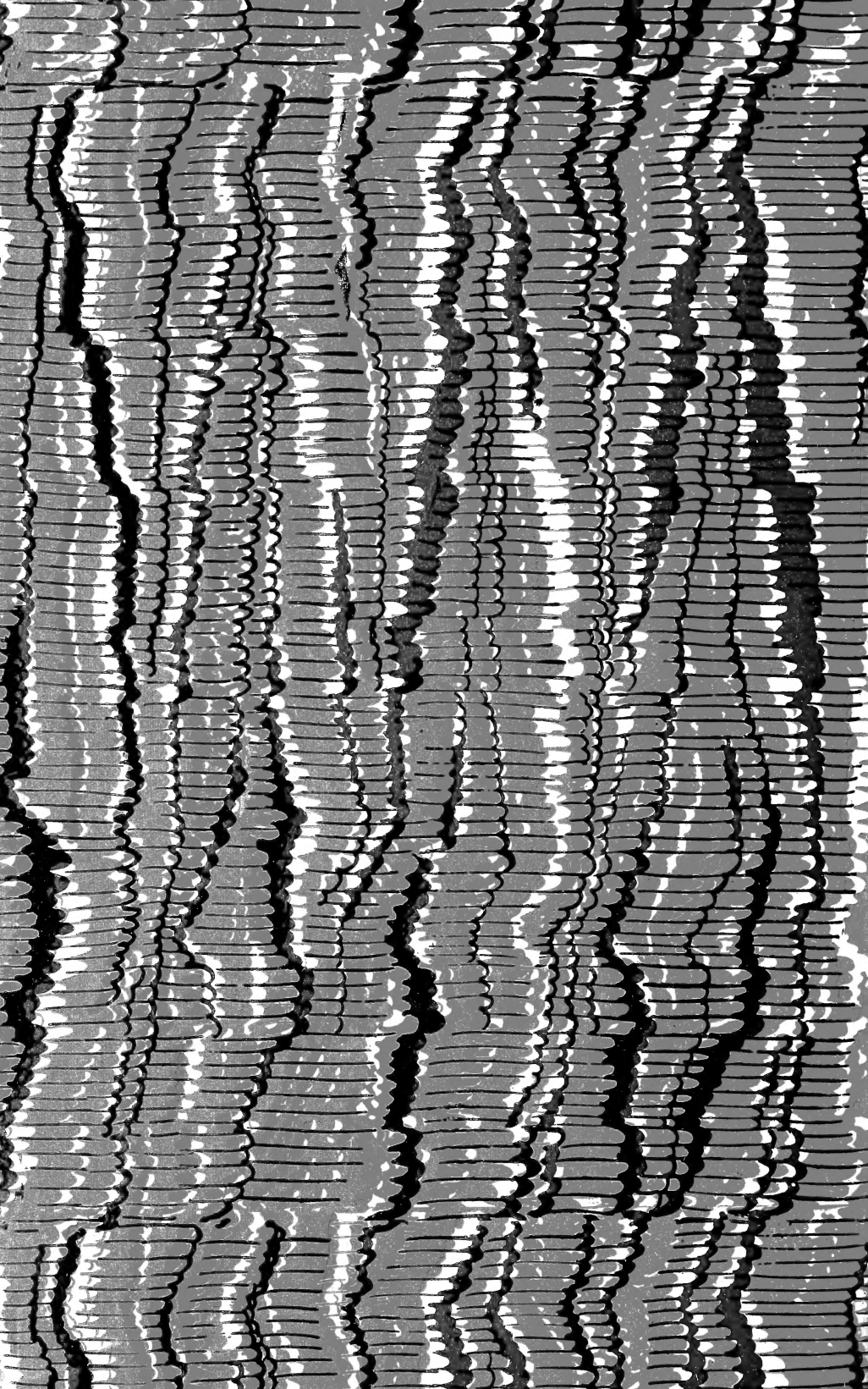
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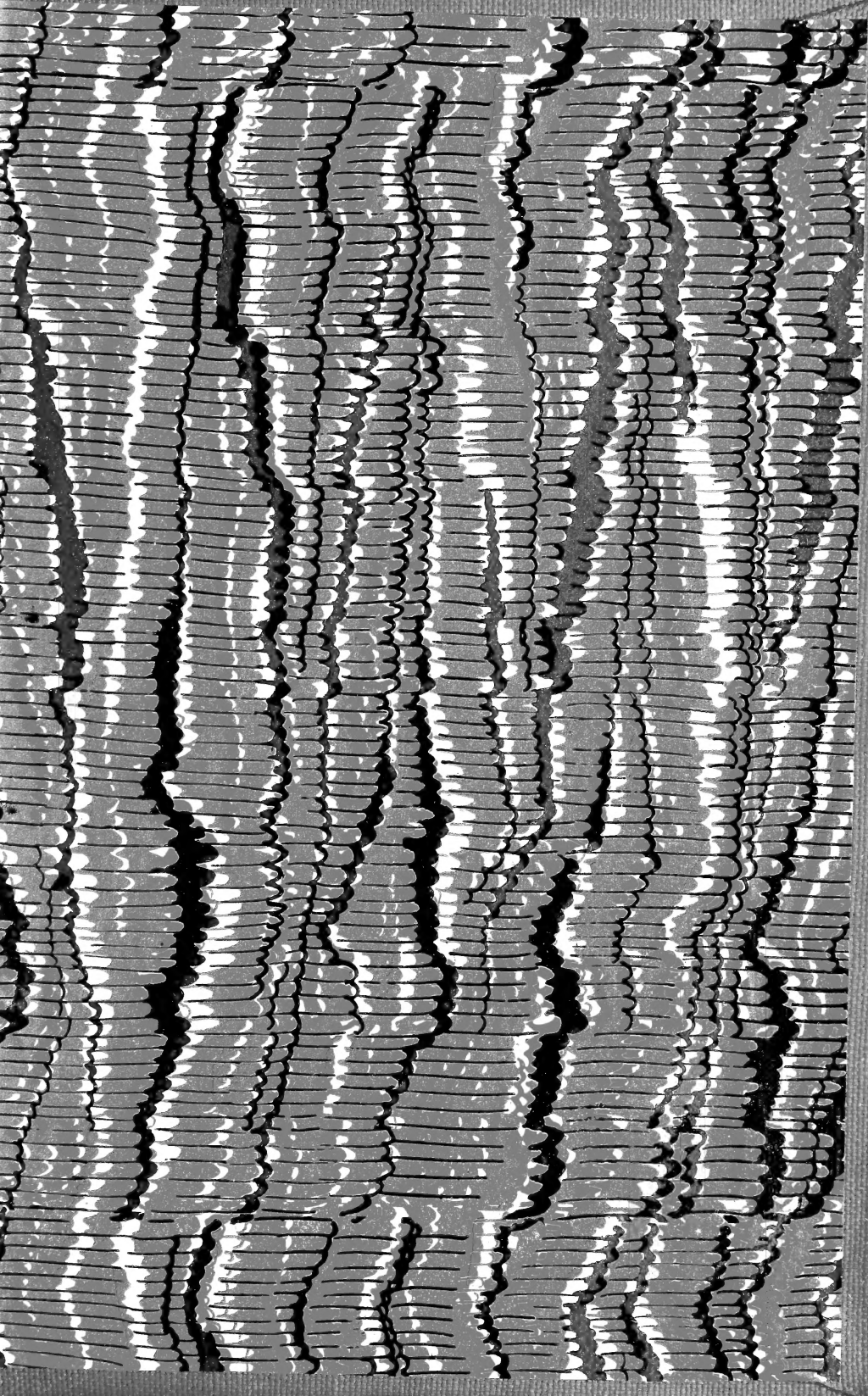
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